WILMINGTON HARBOR 403

LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

Welcome to the Public Scoping Meeting!

3:00 - 7:00 PM

Sunset Park Elementary Cafeteria/ Multipurpose Room

Public Meeting:

Submit a comment card at the In-Person public meeting

E-Mail:

WilmingtonHarbor403@usace.army.mil

Please submit emailed comments by July 22, 2024

Scan the QR Code to access the Project Comment Tool

Online:

Online comments may be made through the Public Comment Tool

The Public Comment Tool can be found on the project website:

https://wilmington-harbor-usace-saw.hub.arcgis.com/

Mail:

US Army Corps of Engineers
Wilmington District
ATTN: Wilmington Harbor 403
69 Darlington Avenue
Wilmington, NC 28403

Please submit mailed comments by July 22, 2024

Public Comments Requested by July 22, 2024

WILMINGTON HARBOR 403

LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

PUBLIC ENGAGEMENT OPPORTUNITIES

The U.S. Army Corps of Engineers Values Your Input!

TASK

Wilmington District is conducting an evaluation of technical and policy concerns noted in the Assistant Secretary of the Army's Civil Work's May 2020 Review Assessment of the North Carolina State Ports Authority's February 2020 Water Resources Development Act (WRDA) 203 Feasibility Study which resulted in conditional authorization in Section 403 of WRDA 2020 of deepening the main channel to 47 feet from the current depth of 42 feet.

PROCESS TIMELINE

- Early Scoping (Spring/ Summer 2023)
  - **Public Comment** » **May 30 - June 30, 2023 Comment Period**
- Develop Alternatives
- **We Are Here**
- **Notice of Intent (Spring/ Summer 2024)**
  - **Public Comment** » **Through July 22, 2024 Comment Period**
- Impacts Analysis/ Refine Alternatives
- Issue Draft Environmental Impact Statement (EIS)
- Public Review and Comment Period (Fall/ Winter 2025)
  - **Public Comment** » **45-day Comment Period**
- Prepare Final EIS/ Respond to Draft EIS Comments
- Issue Final EIS (Fall 2026)
- Record of Decision

PUBLIC INPUT

Considerations when Providing Input to USACE:

- What suggestions do you have related to the evaluation of impacts to resources?
- What concerns do you have for you and your community?
- What resources should be evaluated in the Draft EIS?
- What are some potential project opportunities ? (e.g. mitigation opportunities, beneficial use of dredged material)
- Please provide any data, studies, or reports that would support the analysis in the EIS
- After review of the information provided, is there anything missing?
- What suggestions do you have regarding alternatives to be evaluated in the EIS?

Tips for Comments:

- Detailed specific comments are the most useful:
- Propose detailed solutions/alternatives that can inform alternatives development
- Describe specific examples related to your concern/issue
- Provide details that explain why the issue is important
- Include relevant reports or studies

WAYS TO COMMENT

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Submit a comment card at the In-person public meeting

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PLAN FORMULATION

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

- How would harbor deepening impact you or resources that are important to you?
- What data or information should be evaluated in the EIS?
- What concerns do you have related to potential impacts to resources?
- Do you have data, information, or studies that you can share that would support the evaluation in the EIS?

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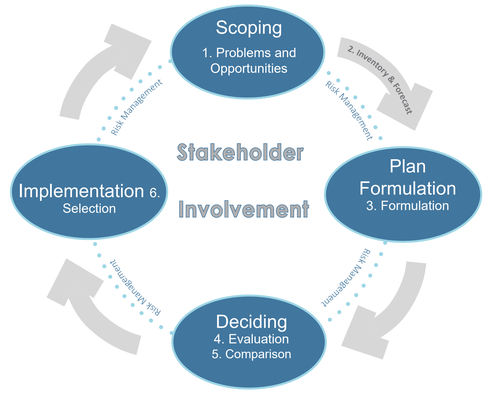
PURPOSE AND NEED

PURPOSE: Contribute to national economic development (NED) by addressing transportation inefficiencies for the forecasted vessel fleet, consistent with protecting the Nation's environment.

NEED: The proposed action is needed to address the constraints that contribute to inefficiencies in the existing navigation system's ability to safely serve forecasted vessel fleet and forecasted cargo types and volumes.

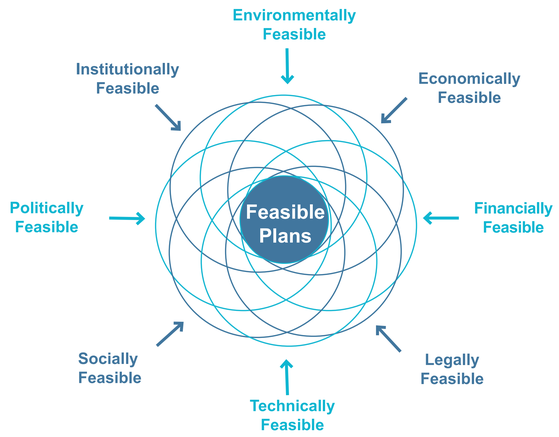
OBJECTIVES

1. Contribute to National Economic Development (NED) by reducing origin to destination transportation costs at the Port of Wilmington over the period of analysis.
2. Contribute to NED by reducing waterborne transportation costs at the Wilmington Harbor Federal navigation project by accomodating the tranit of larger and more efficient vessels, over the period of analysis



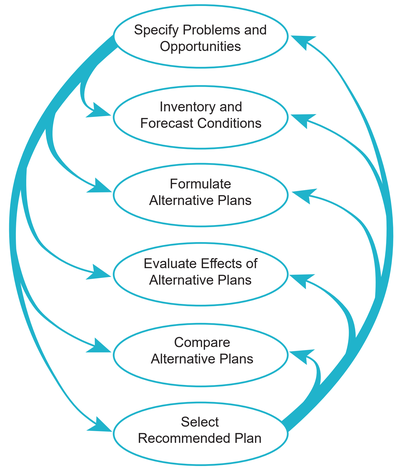
SCREENING OF ALTERNATIVES

- A range of action alternatives will be developed and compared to and contrasted with each other and with the "no action alternative"
- They will be screened terms of their relative:
  - » Effectiveness
  - » Completeness
  - » Efficiency
  - » Acceptability



HOW ARE THE SELECTED ALTERNATIVES IDENTIFIED?

- This analysis examines a broad range of considerations:
  - » Construction, Operations and Maintenance costs
  - » Cost savings associated with navigation improvements
  - » Environmental impacts and mitigation
  - » Social impacts
  - » Cultural and historical resource impacts



WHO MAKES THE FINAL DECISION?

- USACE will submit the final Letter Report and Environmental Impact Statement to the ASA(CW).

WILMINGTON HARBOR 403

LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

BACKGROUND

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

» Why are harbor improvements at Wilmington needed?

» Who would benefit from harbor improvements?

» What else would need to change if the navigation channels are deepened?

» How might this project impact you?

» What should we consider when analyzing this information

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PROJECT DEVELOPMENT THROUGH STATE AND FEDERAL PARTNERSHIP

North Carolina State Ports Authority NCSPA - Section 203 Feasibility Study
(February 2020)

- Conducted by the North Carolina State Ports Authority (NCSPA)
- Section 203 of the Water Resources Development Act (WRDA) of 1986 allows non-Federal interests to conduct their own feasibility study
- Tentatively Selected Plan recommended deepening to 47 feet
- Submitted to the ASA(CW) in February 2020 for Review

Assistant Secretary of the Army (Civil Works) ASA (CW) Review Assessment
(May 2020)

- Transmitted to Congress with unresolved comments including:
  - Reframe assumptions and screening of alternatives
  - Perform economic analysis using USACE methodology at multiple depths
  - Conduct National Environmental Policy Act (NEPA) analysis including supporting engineering modeling and appropriate sea level rise
  - Finalize a mitigation plan and a real estate plan
  - Conduct Independent External Peer Review

Water Resources Development Act WRDA 2020
(December 2020)

- Congress authorized the navigation project, at a total cost of $834,093,000 through Section 403 of Water Resources Development Act (WRDA) 2020
- WRDA 2020 included a condition that a final assessment address the concerns, recommendations, and conditions identified by the ASA (CW)

Section 403 Letter Report & EIS
(2022 - 2026)

- The Wilmington District was tasked with addressing issues from the Review Assessment through a cost-share agreement with the NCSPA
- Products: Letter Report and Environmental Impact Statement (EIS)

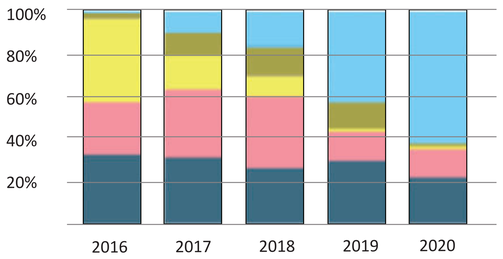
CHANGING VESSEL FLEET

- The larger, more efficient vessel fleet is driving improvements at harbors worldwide as indicated through the percent of container tonnage by vessel class documented in the chart below.

LEGEND

PPX GEN III	(2014)
PPX GEN II	(2000)
PPX GEN I	(1988)
Panamax	(1980)
Sub Panamax	(1956)

PERCENT CONTAINER TONNAGE BY VESSEL CLASS



POST PAN GEN III

Beam	144	168
Draft		51.2
LOA	Up to	1220
TEUs	9,901	15,000

New-Panamax (2014-)
12,500 TEU

(New Panamax, or Ultra Post Panamax)

POST PAN GEN II

Beam	138	144
Draft	39.4	49.2
LOA	911	1,205
TEUs	6,801	9,900

Post-Panamax (2000-)
6,000- 8,500 TEU

(Super Post-Panamax)

POST PAN GEN I

Beam	106	138
Draft	35.4	47.6
LOA	661	1045
TEUs	4,801	6,800

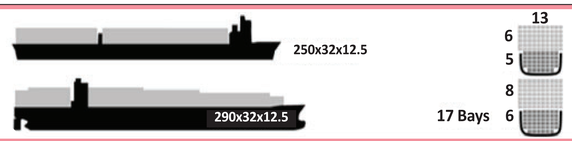
Post-Panamax (1988-)
4,000- 6,000 TEU

(Post-Panamax)

PANAMAX

Beam	98	106
Draft	30.8	44.8
LOA	572	970
TEUs	2,801	4,800

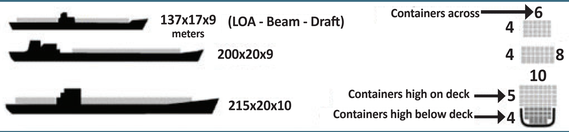
Panamax (1980-)
3,000- 3,400 TEU
Panamax Max (1985-)
3,400- 4,500 TEU



SUB PANAMAX

Beam		98
Draft	8.2	38.1
LOA	222	813.3
TEUs		2,800

Early Containerships (1956-)
500- 800 TEU
Fully Cellular (1970-)
1,000- 2,500 TEU



WILMINGTON HARBOR 403

LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

ECONOMICS

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

» From an economics standpoint, what are concerns / impacts to your community?

» What data or information should be evaluated?

» What concerns do you have related to potential transportation impacts?

» Do you have additional data or information?

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PURPOSE

The United States Army Corps of Engineers (USACE) serves as a steward of taxpayer dollars and conducts an objective analysis to ensure the benefits from constructing a water resource project outweigh the costs.

VESSEL FLEET

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TEUs	9,901	15,000

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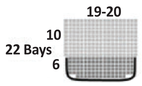

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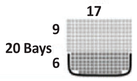

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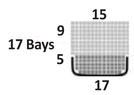

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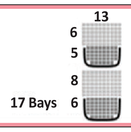

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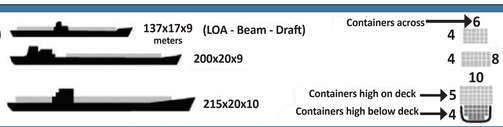


EAST COAST PORTS

Port	Location	Size	Depth
Port Newark-Elizabeth	New York/ New Jersey, USA	272 acres	50 feet
Port of Savannah	Savannah, Georgia, USA	200 acres	47 feet
Port of Virginia	Virginia, USA	1,864 acres	50 feet
Port Miami	Miami, Florida, USA	520 acres	50 feet
Port of Charleston	Charleston, South Carolina, USA	201 acres	52 feet
Port of Wilmington	Wilmington, North Carolina, USA	284 acres	42 feet

PROCESS

Determining USACE Project Participation

USACE participation in projects "…if the benefits to whomsoever they may accrue are in excess of the estimated costs…"

A Benefit-cost analysis is performed:

- Comparing benefits (cargo transportation savings) to the costs of Navigation Improvements
- Benefit Cost Ratio (BCR) in monetary terms, must normally be 1.0 or greater
- Benefits and costs are annualized and estimated over 50-year period of analysis

Basis for Economic Benefits in USACE Navigation Studies

- The reduction in the cost to transport cargo/commodities
- Employment of larger vessels or the more efficient use of vessels
- Economic Assumptions. The action alternatives will not increase the volume of cargo differently than the without project scenario; the same amount of cargo will be moved more efficiently (NED Benefits)

Comparing Alternatives (Benefits)

- Use HarborSym Model to determine future cargo movement costs
  - Captures transportation cost difference due to variation in loading patterns (same cargo – fewer trips, etc.)
  - Calculates vessel time/cost in harbor (nodal network example)
  - Also calculates overseas distance and costs
- Model Future without Project Alternative
  - Nonstructural measures implemented where viable
  - Foreseeable Developments considered
  - Previously scheduled port expansion
  - Landside development in the surrounding area
  - Authorized Operations & Maintenance (O&M) will continue (as authorized)
  - Foreseeable Advance(s) in Technology & Industry Practices applied as appropriate
  - Considers historical/ existing trend not affected by deepening
- Model each Action Alternative

Comparing and Calculating (Costs)

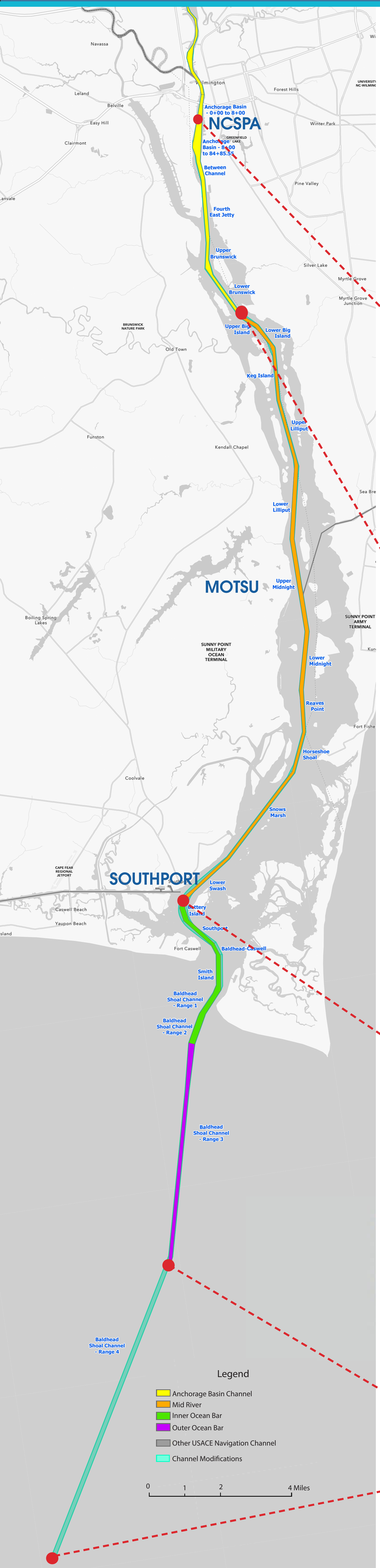
Costs for:

- All Federal and Non-Federal Costs to implement
- Construction and Placement costs
- Real Estate and Environmental Mitigation Costs
- Operations & Maintenance Cost
- Associated costs (USCG Aids to Navigation, etc.)

WILMINGTON HARBOR 403

LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

PRELIMINARY ALTERNATIVES ARRAY



MEASURES FROM THE SECTION 203 FEASIBILITY STUDY

Section 403 of WRDA 2020 authorized the deepening the main channel to 47 feet from the current depth of 42 feet. Additionally, wideners were proposed for the following reaches:

PROPOSED CHANNEL WIDTH KEY
Standardizing Width
Wideners Proposed

REACH		WIDTH		DEPTH - MEAN LOWER LOW WATER (MLLW)		
		Existing Channel Width (ft)	Proposed Channel Width (ft)	Future without Project (ft)	Preliminary 2nd Action Alt. (ft) 46 FT ALT	Conditionally Authorized (ft) 46 FT ALT
ANCHORAGE BASIN	Anchorage Basin - 0+00 to 8+00	448-548	625 - 1509	38	46	47
	Anchorage Basin - 8+00 to 84+85	547-1200	625 - 1509	42		
	Between Channel	500-545	625			
	Fourth East Jetty	455-550	550			
	Upper Brunswick	400-775	500			
	Lower Brunswick	400-775	500			
MID RIVER	Upper Big Island	540-700	660	42	46	47
	Lower Big Island	507-695	500			
	Keg Island	400-695	500			
	Upper LIlliput	400-610	500			
	Lower Lilliput	600	600			
	Upper Midnight	600	600			
	Lower Midnight	600	600			
	Reaves Point	400-600	500			
	Horseshoe Shoal	400-607	500			
	Snows Marsh	400-607	500			
	Lower Swash	400-820	800 - 500			
OCEAN BAR – Inner	Battery Island	500-820	800 - 1300	44	48	49
	Southport	500	800			
OCEAN BAR – Outer	Baldhead - Caswell	500-646	800			
	Smith Island Channel	650-895	900			
	Baldhead Shoal - Reach 1	775-900	750			
	Baldhead Shoal - Reach 2	900	900			
	Baldhead Shoal - Reach 3	500	600 - 900			
OCEAN BAR – Extension	Offshore Extension (New Reach 4)	NA	600			

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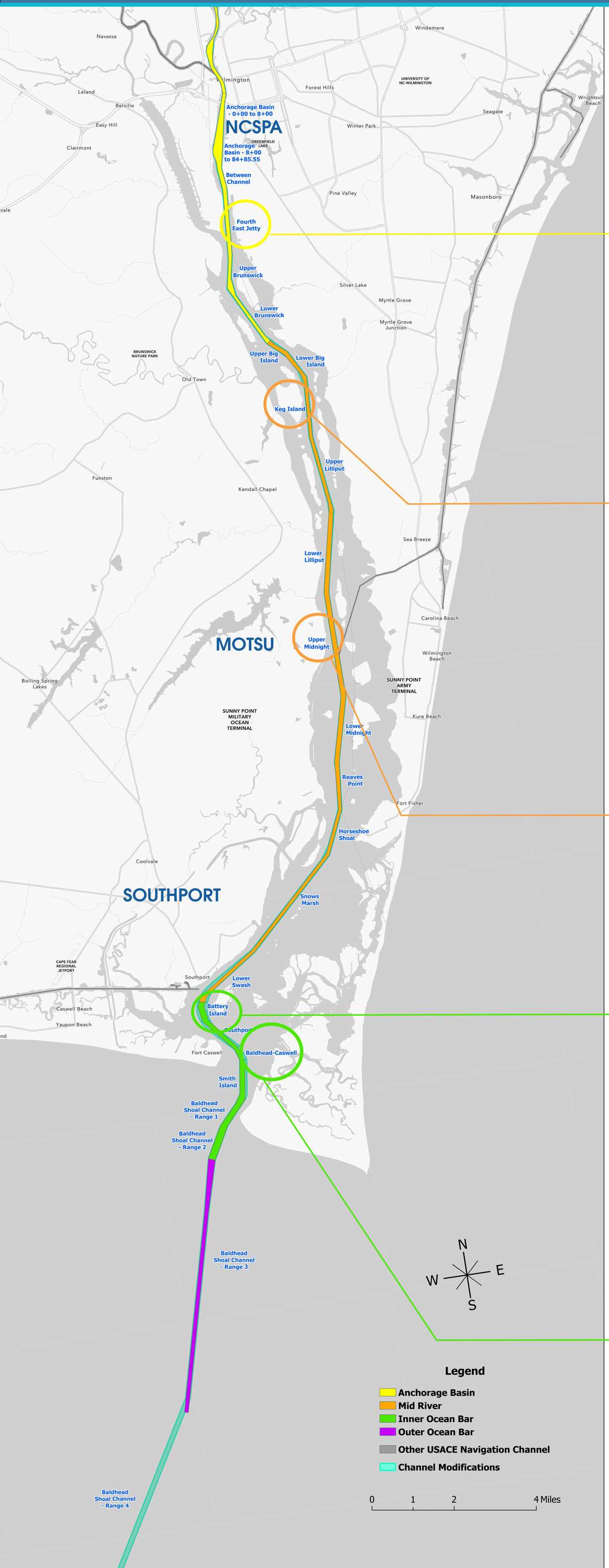
LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

DREDGE CROSS-SECTIONS FOR THE 47' ACTION ALTERNATIVE



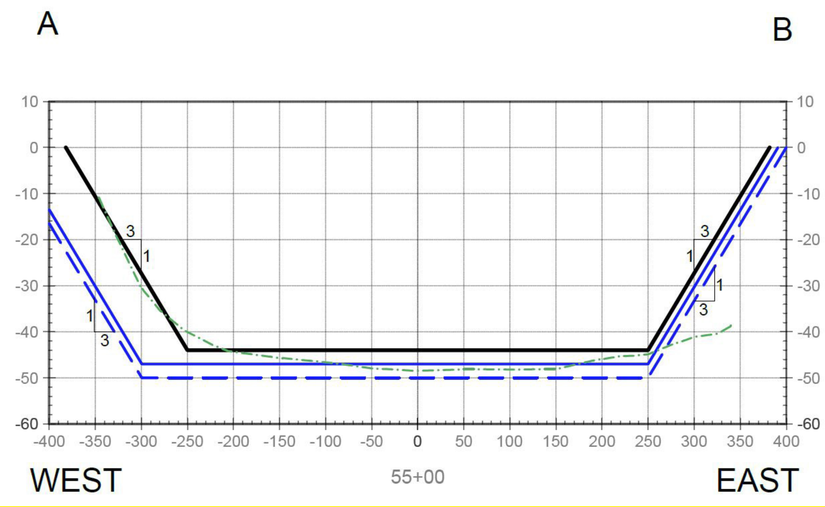
NOTE: The vertical and horizontal scales are not the same

VERTICAL SCALE: 1" = 20'

HORIZONTAL SCALE: 1" = 100'

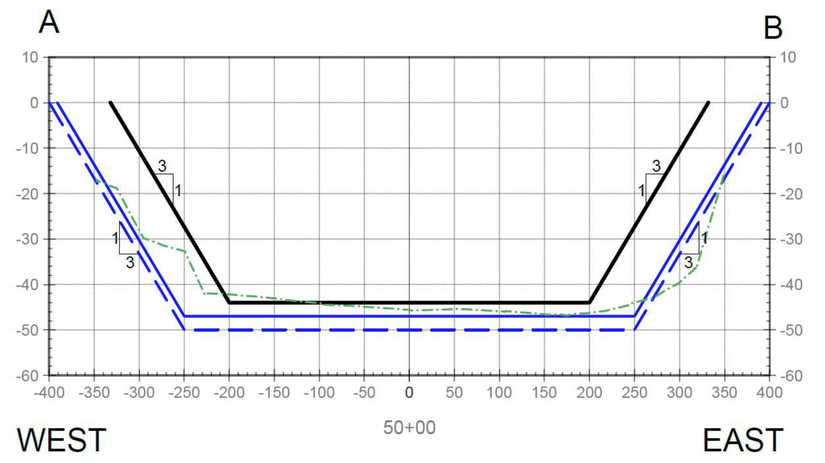
FOURTH EAST JETTY:

One of upper most reaches (Anchorage Basin segment); west side widening only, comprised of soft rock



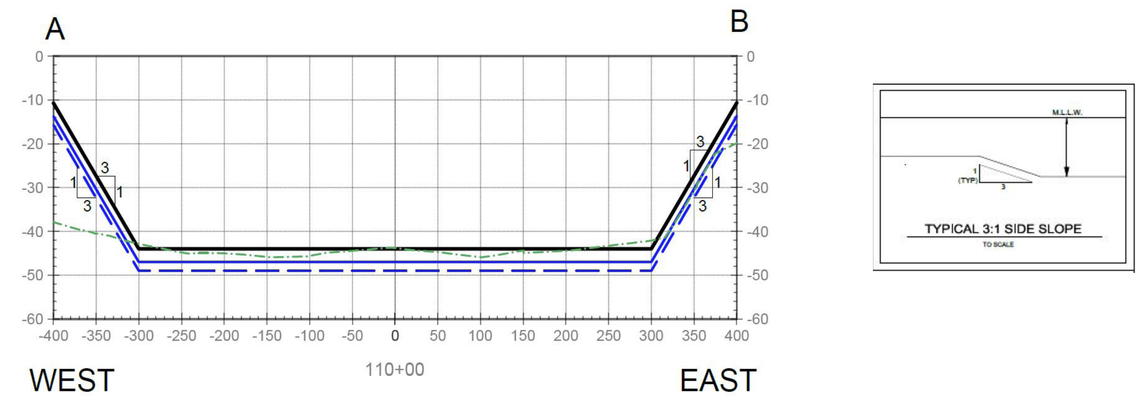
KEG ISLAND:

MidRiver segment; symmetric widening, comprised of hard rock



UPPER MIDNIGHT:

MidRiver segment; adjacent to Brunswick Town; no widening, comprised of non-rock;

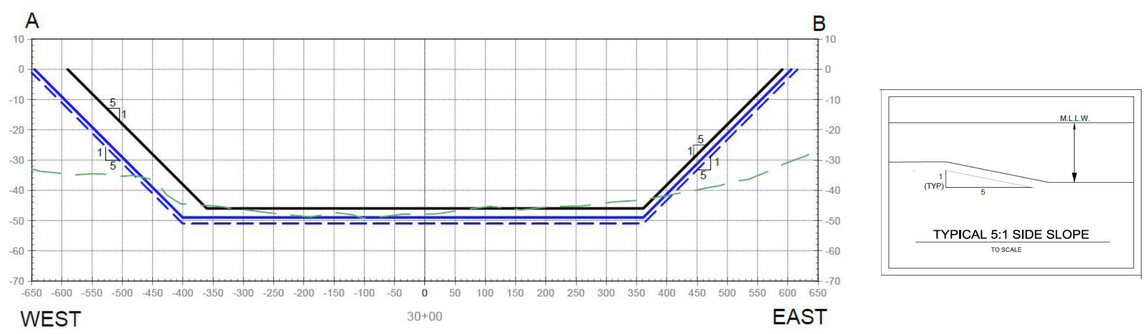


BATTERY ISLAND:

Inner Ocean Bar segment adjacent to Southport; first reach in step-down; symmetric widening; comprised of rock

BALDHEAD SHOAL:

Inner Ocean Bar Segment adjacent to Baldhead Island; part of step-down; west side widening only; comprised of non-rock



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LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

» How would the potential actions, including harbor deepening, impact you or resources that are important to you?

» What concerns do you have for you and your community?

» What resources should be evaluated & what suggestions do you have for impacts analysis in the Draft EIS?

» Are there data, studies, or reports that would support the analysis in the EIS?

» Upon evaluation of the preliminary alternatives, what are some potential project opportunities and what suggestions do you have for the Corps?

» After review of the information provided, is there anything missing?

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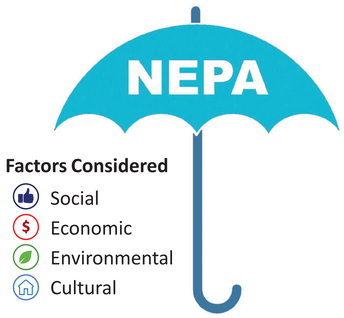

What is NEPA?

- **REQUIRES** all federal agencies to analyze potential environmental, social, and economic impacts of proposed actions and to identify and consider reasonable alternatives to those actions.
- **ENCOURAGES** public involvement throughout the project to help inform decision makers on how the impacts of proposed actions might affect communities.
- **IMPROVES** federal decision making through meaningful public engagement.

Describes the what and why for the proposed action & informs the development of alternatives

Purpose and Need

- **PURPOSE:** Contribute to national economic development (NED) by addressing transportation inefficiencies for the forecasted vessel fleet, consistent with protecting the Nation's environment.
- **NEED:** Address the constraints that contribute to inefficiencies in the existing navigation system's ability to safely serve forecasted vessel fleet and cargo types and volumes.

Where Are We In This Process?

What is an EIS?

- Provides full and fair **discussion of significant environmental impacts**
- **Informs decision makers and the public** of reasonable alternatives that would avoid or minimize adverse impacts or enhance the quality of the human environment
- **Provides evidence** that all the necessary environmental analyses have been conducted

The Public Can Participate by:

- **Commenting** on the proposed actions
- Helping **identify** the issues to be considered
- Provide feedback and help **refine** alternatives
- Providing **information** data/ studies

✓Scoping at Notice of Intent: The Corps invites feedback on the proposed action alternatives and is requestiong information and comment on the analyis of effects.

We Are Here

NEPA Process	Spring - Summer 2023	Fall 2023 - Summer	Summer 2024 - Fall	Fall 2025 - Fall 2026
PROJECT INITIATION • Develop Purpose & Need • Develop Preliminary Scope of The Draft EIS	**SCOPING** • Hold Public meeting • Solicit input regarding: » Scope of analysis » Issues to consider » Alternatives development » Purpose and Need	**ALTERNATIVES DEVELOPMENT** • Develop alternatives screening criteria • Develop alternatives by combining remaining measures • Screen reasonable alternatives	**ANALYSIS** • Describe affected environment • Assess impacts of reasonable array of alternatives • Identify preferred alternative • Draft EIS documenting natural, cultural, and socioeconomic impacts	**DECISION** • Review and develop responses to comments on Draft EIS • Provide final EIS • Prepare and Publish Record of Decision
STAKEHOLDER/ PUBLIC ENGAGEMENT	**PUBLIC SCOPING** *(Comment Period May 30 - June 30, 2023)*	**PUBLIC OUTREACH -** Notice of Intent *(Comment Period through July 22, 2024)* *Solicit public input on the alternatives*	**PUBLIC COMMENT** Release Draft EIS *(45-day comment period)*	
IMPACT EVALUATION AND MITIGATION	**IDENTIFY SIGNIFICANT RESOURCES** Examples Include: • Wetlands • Fish & Wildlife • Water Quality • Air Quality • Environmental Justice • Cultural Resources	**DETERMINE EXTENT OF IMPACTS** • Consult with Federal, State, and local resource experts • Conduct modeling to determine the level of impact to significant resources	**AVOID OR MINIMIZE IMPACTS** • Identify avoidance or minimization action to reduce impacts • Develop mitigation strategies in coordination with stakeholders • Integrate into Draft EIS	**DEVELOP MITIGATION STRATEGIES** • Refine mitigation strategies based on Public Review • Integrate into EIS

WILMINGTON HARBOR 403

LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

ENVIRONMENTAL RESOURCES

Are there any resources not included on this board you feel should be evaluated? Please let us know!

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

» How would harbor deepening impact you or resources that are important to you?

» What resources should be evaluated in the EIS?

» What are some opportunities that may become available if the project takes place?

» What concerns do you have related to potential impacts to resources?

» Do you have data, information, or studies that you can share that would support the evaluation in the EIS?

» After review of the information provided, is there anything missing?

WAYS TO COMMENT:

Mail:
US Army Corps of Engineers
Wilmington District
ATTN: Wilmington Harbor 403
69 Darlington Avenue
Wilmington, NC 28403

Email:
WilmingtonHarbor403@usace.army.mil

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Physical Resources

- Water Quality
  - Dissolved Oxygen
  - Salinity
  - Temperature
- Air Quality
  - Emissions Inventory
  - Greenhouse gases
- Noise
- Visual/Viewshed
- Hydrology/Flooding
  - Shoreline/Vessel Wake Analysis
- Groundwater

Erosion control at Brunswick Town and Fort Anderson Historic Site Credit: Scenic Consulting Group

Coastal Wetlands. Credit: UNCW

Social Effects

- Environmental Justice
- Historic/ Cultural Resources
- Traffic/ Transportation
- Recreation

Kayaking Cape Fear River. Credit: USACE

Battleship North Carolina. Credit: Wilmington, N.C. River District & Island Beaches

Striped Bass. Credit: NOAA Fisheries

Ecological Resources

- Wetlands
  - Provide ecological services
- Shallow Soft Bottom
  - Provides unique habitat for algae, fish, and invertebrates
- Threatened and Endangered Species
  - Protection under the Endangered Species Act
- Essential Fish Habitat
  - Provides key fish habitat for spawning, feeding, and growth
- Bird Habitat
  - Project area is in Atlantic flyway and provides resting and nesting habitat for various bird species
- Primary Nursery Areas
  - Provide forage and shelter for juvenile fish and other species, sustaining healthy fisheries
- Invasive Species
- Marine Mammals

Atlantic Sturgeon swimming. Credit: NOAA Fisheries

Rufa Red Knot. Credit: Cornell University

Climate Change

- Climate change effects on future conditions in the project area with and without the project, including:
  - Sea level rise
  - Precipitation and coastal storm frequency and intensity
  - Increasing atmospheric and sea surface temperatures

Hurricane Irene. Credit: NASA

WILMINGTON HARBOR 403

LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

WETLANDS

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

- How would harbor deepening impact wetland resources?
- What wetland data or information should be evaluated in the EIS?
- What concerns do you have related to potential wetland impacts?
- What concerns do you have related to determining wetland impacts and compensatory mitigation using the Uniform Mitigation Assessment Method (UMAM)?
- Do you have data, information, or studies that you can share that would support the evaluation in the EIS?

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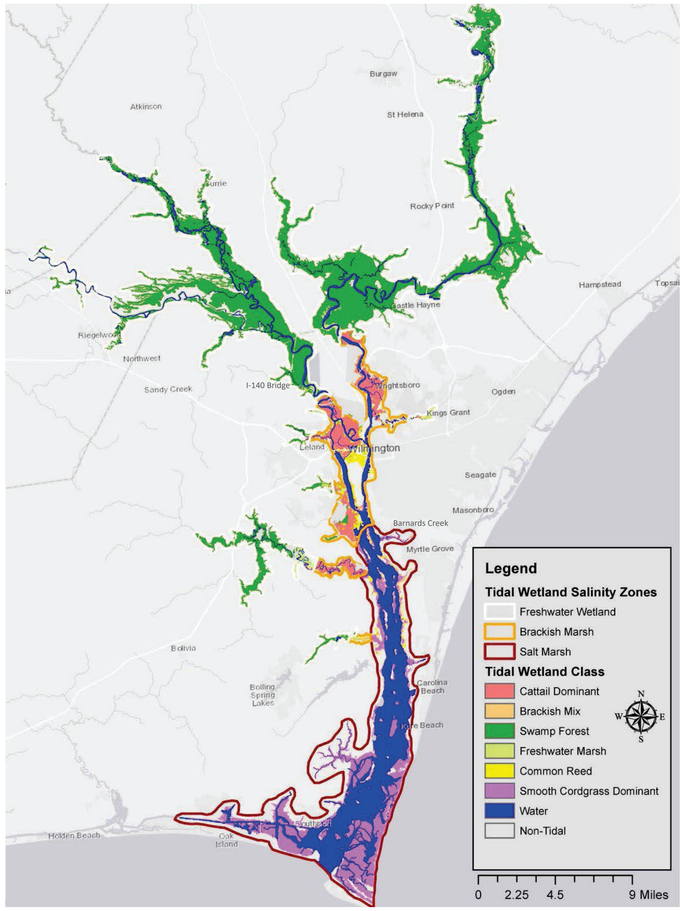
WETLAND TYPES



SALINITY ZONES in the study area are based on landscape position along salinity gradients

- Northeast Cape Fear River wetlands transition from brackish marsh to freshwater marsh/swamp forest
- I-140 Bridge marks transition from brackish marsh to tidal freshwater marsh and swamp forest
- Freshwater marsh exist north of mouth of Northeast Cape Fear River
- Oligohaline (very low salinity: 0.5-5.0 ppt) brackish marshes exist along approx. 10 miles of river north of Barnards Creek
- Salt marsh dominate polyhaline (brackish: 18.0-30.0 ppt) & lower mesohaline (low salinity: 5.0-18.0 ppt) reaches of the Cape Fear River

WETLANDS.

- NORTHEAST CAPE FEAR RIVER WETLANDS. Species include wild rice, arrowhead, pickerelweed, arrow arum, sawgrass, three-square, sedges, salt marsh aster; tidal swamp forest includes bald cypress, water and swamp tupelo
- I-140 BRIDGE. Marsh species include those noted above, as well as, sawgrass, three-square, sedges, salt marsh aster; tidal swamp forest includes bald cypress, water and swamp tupelo
- TIDAL FRESHWATER MARSH. Species include cattail, wild rice, arrowhead, pickerelweed, arrow arum
- TIDAL BRACKISH MARSH. Dominated by cattail w/ fringing smooth cordgrass along channel
- TIDAL SALT MARSH. Dominated by smooth cordgrass w/ narrow to no high marsh (black needlerush/ saltmeadow cordgrass); common reed dominates high portions of marsh above tide line

POTENTIAL WETLAND IMPACTS

CONVERSION OF WETLAND TYPES due to the project may occur (i.e. marsh to open water, freshwater to brackish, brackish to saline, etc.)

DIRECT LOSS OF WETLANDS may occur from changes to hydrology and shoreline erosion

HYDROLOGIC AND SALINITY MODELS are being developed to assess project impacts on wetlands

U.S. ARMY CORPS OF ENGINEERS WILL ASSESS the wetland functional loss related to the proposed action, and identify any necessary Compensatory Mitigation

UNIFORM MITIGATION ASSESSMENT METHOD

OVERVIEW

- Comprehensively assess affected areas:
  - Wetlands
  - Benthic habitat (SAV, hard bottom, shellfish)
  - Open water
- Rapid assessment approach
- Versatile/adaptable application
  - Assesses loss of wetland function & proposed mitigation
  - Detailed assessments using reference sites/wetlands
- Used to identify and assess appropriate mitigation for functional losses

CAPABILITIES

- UMAM captures all relevant details of a wetland assessment area
- The function scores are overall scores of the assessment area
- Location and Landscape Support function includes listed species and general wildlife
- Water Environment function captures impacts due to increased salinity (i.e., hydrologic stress, vegetation changes, etc.)
- Assessment areas can be combined if reasonably similar and like the reference site
- Used to identify potential compensatory mitigation

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LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

AQUATIC RESOURCES

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

- How would harbor deepening impact you or resources that are important to you?
- What data or information should be evaluated in the EIS?
- What concerns do you have related to potential impacts to aquatic resources?
- Do you have data, information, or studies that you can share that would support the evaluation in the EIS?

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ENDANGERED SPECIES/PROTECTED SPECIES

ENDANGERED SPECIES ACT (ESA).

- Potential Effects to Species and designated Critical Habitat protected under the ESA

INTEGRATION OF ESA SECTION 7 CONSULTATION WITH NEPA.

- Biological Assessments (BA) will be prepared in coordination with National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) as required in the ESA, Section 7
- BAs will be included as appendices to the draft EIS (DEIS)

POTENTIAL ROUTES OF EFFECT.

- Vessel strikes
- Hopper dredge entrainment
- Confined blasting
- Water quality impacts to habitat
- Substrate changes
- Obstacles to migration

COORDINATION CONCURRENT WITH PREPARATION OF THE DRAFT EIS.

- Migratory Bird Treaty Act
- Magnuson-Stevens Fishery Conservation Management Act, Essential Fish Habitat
- Marine Mammal Protection Act
- Fish and Wildlife Coordination Act

	ESA SPECIES	STATUS	CRITICAL HABITAT
NMFS	Giant Manta Ray	Threatened	No
NMFS	Atlantic Sturgeon	Endangered	Yes
NMFS	Shortnose Sturgeon	Endangered	No
NMFS	Fin Whale	Endangered	No
NMFS	North Atlantic Right Whale	Endangered	Yes
NMFS	Sei Whale	Endangered	No
BOTH	Green Sea Turtle	Endangered	Proposed
BOTH	Hawksbill Sea Turtle	Endangered	No
BOTH	Kemp's Ridley Sea Turtle	Endangered	No
BOTH	Loggerhead Sea Turtle	Threatened	Yes
BOTH	Leatherback Sea Turtle	Endangered	No
USFWS	Piping plover (shorebird)	Threatened	No
USFWS	Red knot (shorebird)	Threatened	Proposed
USFWS	Roseate tern (water-dependent bird)	Endangered	No
USFWS	Eastern black rail (water-dependent bird)	Threatened	No
USFWS	West Indian manatee	Threatened	No
USFWS	Magnificent ramshorn (freshwater snail)	Endangered	Yes
USFWS	Atlantic pigtoe (freshwater mussel)	Endangered	No

AQUATIC HABITAT - DIRECT IMPACTS

DIRECT IMPACTS TO BENTHIC (RIVER BOTTOM) HABITAT.

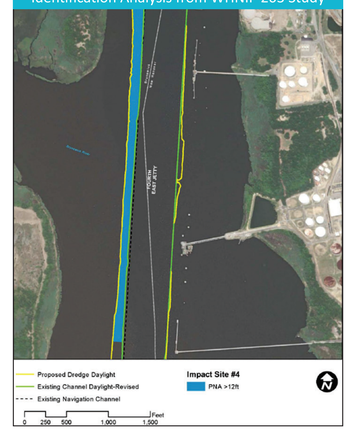
- Estuarine soft bottom habitat may be directly impacted (deepened) by channel modifications

Potentially impacted areas will be identified via a GIS analysis of bathymetric data and project design. Functional loss of habitat due to increased depth in and around the channel will be evaluated in coordination with state and federal agency biologists.

POTENTIAL RESOURCES IMPACTED INCLUDE:

- Primary Nursery Areas
- Macroinvertebrate communities
  - Abundance and diversity
- Foraging habitat for nursery species
- Primary producer productivity
- Shallow habitat refuge from large predatory species

Identification Analysis from WHNIP 203 Study

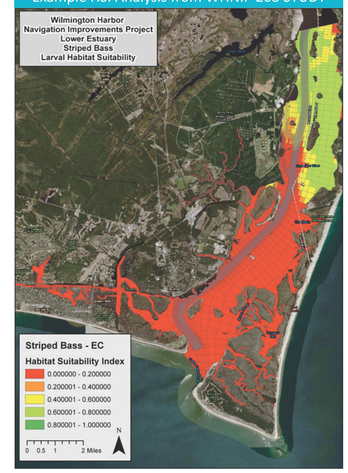


AQUATIC HABITAT - INDIRECT IMPACTS

HABITAT SUITABILITY INDEX (HSI) MODELS.

- Identifies potential indirect impacts to fish and fish habitat associated with each alternative
- Indicator species selected:
  - Atlantic sturgeon
  - Blueback herring
  - Striped Bass
  - Southern flounder
  - Previous studies: redfish, white shrimp
  - Eastern oyster
  - American shad
  - Spot
- Example Model Inputs
  - Hydrodynamic model outputs: Temperature, dissolved oxygen, salinity
  - GIS datasets: Wetland presence, substrate, depth
  - Other data: zooplankton concentration, freshwater flows
- Different species models analyze different portions of the water column
- Conditions with and without the project can be compared to assess changes in habitat quality due to the project

Example HSI Analysis from WHNIP 203 STUDY



AQUATIC HABITAT – INVASIVE SPECIES RISK

- Quantifiable using:
  - Shipping frequency
  - Shipping connectivity
  - Hull sizes
  - Ballast quantities
- Driven by economic forecasting
- Will be compared across alternatives

WILMINGTON HARBOR 403

LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

MITIGATION PLANNING

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

- How would harbor deepening impact you or resources that are important to you?
- What are some potential mitigation opportunities that may be possible if the project takes place?
- What concerns do you have related to potential impacts to resources?
- Do you have data, information, or studies that you can share that would support the evaluation in the EIS?

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USACE MITIGATION POLICY

- Mitigate for functional impacts/loss
- Habitat-based evaluation methodologies must meet USACE model certification and approval requirements
- Mitigation plans must include an incremental cost analysis
- Mitigation must be compensatory to the effect
- Monitoring is required for all mitigation measures

U.S. ARMY CORPS OF ENGINEER (USACE) has responsibility under section 906 of the Water Resources Development Act (WRDA) of 1986, to mitigate for damages to ecological resources, including terrestrial and aquatic resources, and fish and wildlife losses that result from a water resources development project.

MITIGATION PLANNING PROCESS	
Identify Significant Resources	Identify significant ecological resources that may be impacted by the proposed project
Evaluate Impacts	Assess the degree of the impact to affected resource and identify significant unavoidable effects.
Determine Mitigation Objectives	Determine mitigation objectives for the affected resources, objectives reflect the significant unavoidable effects
Identify Mitigation Strategies and Measures	Assess mitigation measures and strategies necessary to achieve the objectives and compensate for unavoidable habitat impacts
Formulate Mitigation Plan Alternatives	Screen mitigation measures and combine into mitigation plan alternatives
Analyze Cost Effectiveness of Mitigation Alternatives	Conduct incremental cost analysis and cost effectiveness of mitigation plan alternatives
Recommended Compensatory Mitigation Plan	Plan selection based on the mitigation alternative that provides full mitigation of losses and meets the mitigation objectives. USACE also evaluates tradeoffs and other selection factors. No other plan meets the mitigation objectives at a lower cost.
Monitoring and Adaptive Management Plan	Identify monitoring elements to increase knowledge of affected resources and evaluate the success of mitigation efforts to inform adaptative management

WILMINGTON HARBOR 403

LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

ENGINEERING CONSIDERATIONS

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

» How would harbor deepening impact you or resources that are important to you?

» What data or information should be evaluated in the EIS?

» What are some potential beneficial use opportunities that may be possible if the project takes place?

» What concerns do you have related to potential impacts to resources?

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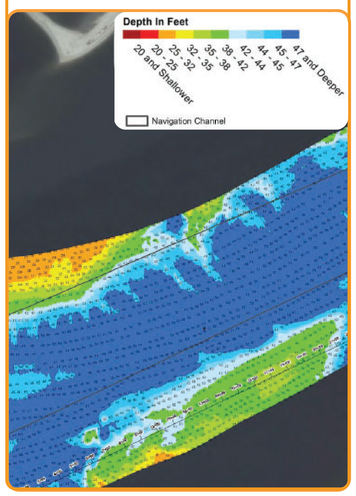
DATA COLLECTION

Hydrographic Surveys

- Provides information about the depth of the channel bottom and allows for a volumetric computation of the material to be removed.



Geotechnical Considerations

- Subsurface Information beneath the channel bottom define the sediment and rock types which is used to determine if dredged material can be used for beach placement, bird island or wetland restoration, or reef construction.

DREDGING METHODS

- Various dredging methodologies can be employed to remove material based on its characteristics.
- Equipment used to deepen or widen a channel is determined by site characteristics, such as the type and location of sediments along a channel bottom.

Hydraulic Dredges

Hopper Dredge

Hopper dredges are self-propelled and pump material into onboard hoppers for transportation to the disposal site; similar to a vacuum cleaner.

Hopper Dredges are used primarily for sandy and silty material.

Cutterhead Dredge

The hydraulic cutterhead dredges use a mechanical arm equipped with rotating blades to cut and dislodge materials and pump to the disposal/ placement site through a pipeline.

Cutterhead Dredges are used in areas where dredged material contains clay, sand, rock, or other hard consolidated materials.

Mechanical Dredges - enable more precise dredging

Clamshell Dredge

Clamshell dredges lift material from the sea floor or river bottom using a bucket attached to a boom. Material is then placed on a barge for transport to the disposal site, similar to a crane and a dump truck.

For Limited Use – This system may be used around sensitive cultural sites.

Excavator Dredge

Backhoe dredges are basically land excavators that have been modified for use on water. The loaded bucket is hoisted to the surface and usually side dumped into a barge.
For Limited Use – This system may be used in shallow areas and around sensitive cultural sites that contain clay, sand, rock or other hard consolidated materials.

PLACEMENT OF DREDGED MATERIALS

- Dredged material, depending on its grain size, may be placed on beneficial use placement areas or offshore in an existing placement area known as the Ocean Dredged Material Disposal Sites (ODMDS).

Battery Island which is home to one of the largest rookeries in the area for the White Ibis. Some of the dredged sediments could be used to expand this nesting area that is populated with hundreds of nests each year.

- Beneficial Use Placement sites include bird islands, wetlands, areas for reef construction, and local beaches. These sites are selected for placement by understanding the sediment and rock types beneath the channel bottom.

Example Beneficial Use Placement - Wilmington Inner Ocean Bar Project dredges the shoaled sand material from within the Wilmington Harbor shipping channel and places it on adjacent beaches.

WILMINGTON HARBOR 403

LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

GEOTECHNICAL

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

» Do you have any additional subsurface data or know of any studies performed that would be beneficial to understanding the subsurface beneath the shipping channel?

» What subsurface information should be evaluated in the EIS?

» What concerns do you have with underwater confined blasting? Are there any significant environmental or cultural resources that we should be aware of if underwater confined blasting were to occur?

» What specific reaches/areas in the shipping channel would you like us to gather more information regarding the subsurface?

» What specific reaches/areas within the channel give you concern if deepened?

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GEOTECHNICAL & GEOPHYSICAL TIMELINE

Wilmington Harbor Deepening – 1964 -30 MLLW

- Borings – 25
- Wash Probes – 0
- Vibracores – 0
- Geotechnical data from 1964

Wilmington Harbor Deepening – 1993 -40 ft MLLW

- Borings – 193
- Wash Probes – 402
- Vibracores – 0
- Geotechnical data collected from 1987, 1989, 1990, 1991, 1992, 1993, 1994

Wilmington Harbor Deepening - 2000 -42/44 MLLW

- Borings – 259
- Wash Probes – 704
- Vibracores – 469
- Seismic Reflection Survey – 1994 and 1997
- Geotechnical data collected in 1998, 1999, 2000, 2002, and 2005

Wilmington Harbor Improvement Project - 2015

- Borings – 0
- Wash Probes – 318
- Vibracores – 95
- Geotechnical data collected in 2006, 2008, 2010, 2012, 2013, and 2015

Wilmington Harbor 203 - 2019

- Borings – 0
- Wash Probes – 0
- Vibracores – 0
- Seismic Reflection Survey- 2017

Wilmington Harbor 403- Present

- Borings – 0
- Wash Probes – 0
- Vibracores – 85
- Geotechnical data collected in 2023

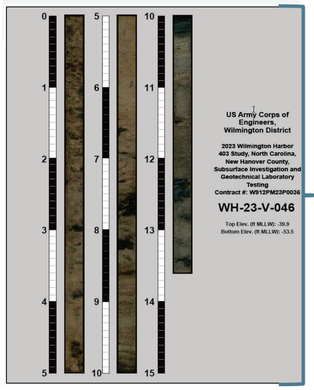
SUBSURFACE EVALUATION OF SEDIMENTS

- Dredge material types by % of total dredge volume throughout the entire project.and are subject to change
- Developed using historic subsurface data

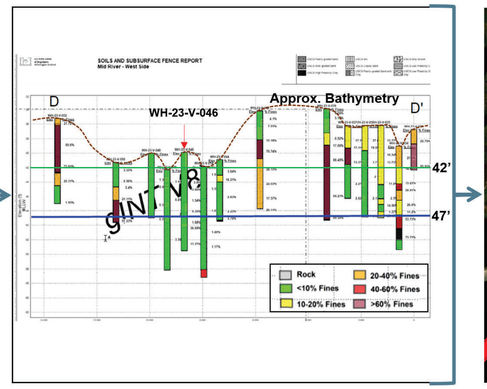
DREDGED MATERIAL TYPE	% TOTAL DREDGE VOLUME
Sand	14%
Silty/ Clayey Sand	29%
Clays/ Silts	30%
Combination- Sands; Silts; Clays; Gravel	12%
Soft Rock	9%
Hard Rock* pre-treatment required (i.e. rock chopping or blasting)	2%
Unknown areas will be investigated (including Bald Head Shoal Reach 4)	4%

GEOTECHNICAL PROCESS - DATA COLLECTION, ANALYSIS, & DEVELOPMENT OF MATERIAL TYPE

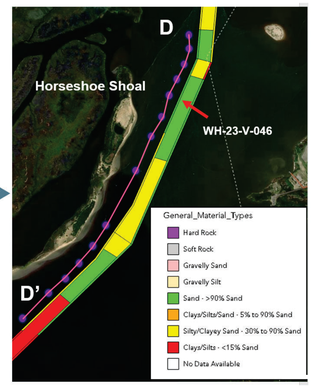
VIBRACORE SAMPLE IN HORSESHOE SHOAL REACH



PROFILE OF HORSESHOE SHOAL REACH DEPICTS SUBSURFACE MATERIAL TYPES



DREDGED MATERIAL TYPES GENERALIZED AND MAPPED



SAMPLING (1964-2023).

- 1,544- Wash probes, SPTs/ Rock Borings, Vibracores

INVESTIGATION RESULTS.

- Calculation of quantities for each reach broken out by dredged material type
- Evaluation of appropriate placement locations (i.e. beach placement, habitat restoration, or shoreline protection)
- Development of specific material extents within each specific reach
- Identify data gaps for future investigations

SEDIMENT QUALITY TESTING

WHEN WILL SEDIMENT BE TESTED?

Before dredging, during the Pre-Construction Engineering and Design (PED) phase

WHAT TYPE OF TESTS WILL TAKE PLACE?

Engineering. To determine the visual classification (USCS symbol) and grain sizes of unconsolidated sediments we will perform the following three tests:

- ASTM D6913, Particle-Size Distribution of Soils Using Sieve Analysis
- ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes
- Visual, volumetric percentage of shell and rock fragment determination.
- Additional tests as needed for consolidated sediments, ie. rock

Environmental. Testing requirements for compliance with Clean Water Act and other environmental laws will be coordinated with state and federal agencies, such as the North Carolina Department of Environmental Quality and U.S. Environmental Protection Agency.

TOP OF ROCK SURFACE

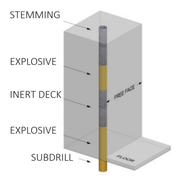
ROCK TYPES IN CHANNEL

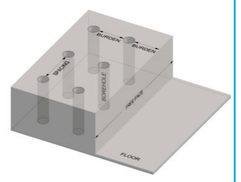
- Limestone, siltstone, cemented quartz and
- Assessment of hard rock and soft rock areas is critical for engineering and cost estimate assumptions
- Evaluation is done by assessing the rock strengths to determine if pre-treatment is required (ie. blasting or rock chopping)

BLASTING HARD ROCK

CONCEPTUAL BLAST PLAN.

- Pre-treatment of “hard” rock to allow it to be removed
- Confined Underwater Blasting
- Controlled detonation method
- Stemming materials placed above explosives in borehole
- Blasting occurred in the 96 Act deepening effort with blasting activities in the early 2000s (Lower Brunswick through Keg Island)
- Confined underwater blasting took place in densly populated areas (Miami, New York Harbors, etc.)





- Typical blasthole configuration with stemming as well as an example of shot pattern design (USACE, 2018)
- Studies have shown that stemmed blasts have up to 60-90% decrease in the strength of pressure wave release compared to open water blasts of the same charge weight (Nedwell and Thandavamoorthy, 1992; Hempen et al. 2007)

CONCEPTUAL BLAST MITIGATION PLAN

PURPOSE.

- Facilitate coordination under Marine Mammal Protection Act, Endangered Species Act, and Magnuson-Stevens Fisheries Conservation and Management Act
- Develop guidance for coordination and required information for full development of the blast mitigation plan during the design and construction phase.

OBJECTIVES.

- Evaluate potential effects to ecological resources related to blasting
- Provide mitigation recommendations, including physical and non-physical measures to minimize impacts based on biological considerations, as well as any other avoidance or minimization measures.

WILMINGTON HARBOR 403

LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

GROUNDWATER, WATER QUALITY, & AIR QUALITY

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

» Do you have any additional Water Quality, Air Quality or Groundwater data or know of any studies performed that would be beneficial?

» What concerns do you have related to water quality, groundwater, or air quality or the an

» What specific reaches/areas within the channel give you concern if deepened?

» Do you have data, information, or studies that you can share that would support the evaluation in the EIS?

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WATER QUALITY - MODEL OUTPUTS

INTENT.

Compare changes to water quality parameters

ANALYZE.

- Future without Project, Action Alternative 1 (47 ft Conditionally Authorized Depth), Action Alternative 2

DETERMINE/ DEVELOP.

- Temporal resolution daily to seasonal/annual
- Spatial resolution as high as 20 m, 10 vertical layers
- Salinity peaks and ranges (summer, winter, surface, bottom, etc.)
- Dissolved oxygen peaks and ranges
- Temperature
- Results in graphical form (2D maps, vertical profiles, time series)
- Results in tabulated form (tables and spreadsheets of parameters of interest)

WATER QUALITY – CWA SEC 401 COMPLIANCE

CLEAN WATER ACT SECTION 401 WATER QUALITY CERTIFICATION (WQC)

- Section 401 of the CWA requires that any deposition of dredged or fill material into waters of the United States comply with North Carolina water quality standards.

TURBIDITY.

- Cloudiness or haziness of a fluid caused by large numbers of suspended individual particles

QUALITATIVE ASSESSMENT.

- Proposed channel deepening and widening in the project area may encounter rock and sediments
- Sediments may range from fines (silts and clays) to sandy material (what you may see on a beach)
- Dredging and dredged material placement are expected to have only short-term impacts, meaning turbidity and associated environmental effects will be temporary

GROUNDWATER ANALYSIS

INTENT.

- Groundwater is an important resource and additional analysis is underway
- A computer groundwater model will be used to predict impacts of the project

MODEL DATA INPUTS.

- Topographic/Bathymetric Data; hydrogeologic layering
- Groundwater levels and salinity at monitoring wells (Delft 3D)
- Groundwater withdrawals
- Precipitation

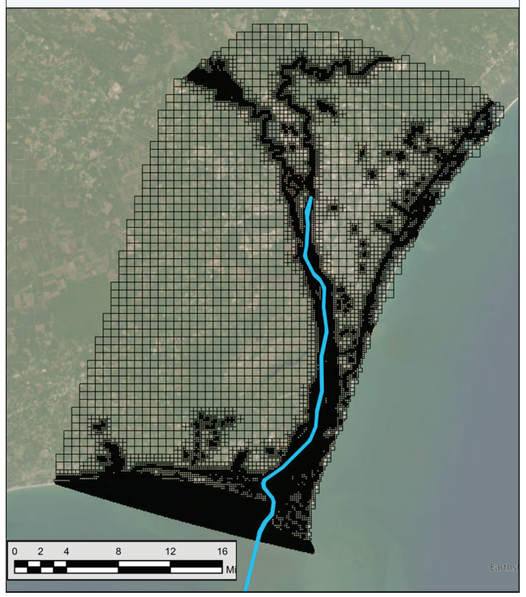
MODEL PREDICTIONS.

- Groundwater level changes due to project
- Groundwater flow direction changes due to project
- Saltwater intrusion into aquifers due to project

MODEL SCENARIOS.

- Using 3 sea level rise scenarios
- Using 2 future well withdrawal scenarios

GROUNDWATER MODEL EXTENT & GRID MESH



AIR QUALITY

GOAL. Understand impacts from air emissions and greenhouse gases (GHGs) from current operations, future conditions, and construction activities.

- Base operations – most recent year of data, 2023
- Future without Project, Action Alternative 1 (47 ft Conditionally Authorized Depth), Action Alternative 2

METHOD. Emissions from criteria pollutants, greenhouse gases, and hazardous air pollutants, as available, will be calculated as part of the analysis:

- Sources to be Included: Mobile sources – ocean-going vessels, harbor craft, cargo handling equipment, on-road vehicles, construction equipment, locomotives & Stationary sources from facilities located on port authority property.
- Geographical Domain: Marine boundary – transit area, maneuvering areas, hoteling area, anchorage zone; & Land-side boundary – intermodal terminals, staging areas, railyard, on-port roads
- Time Domain – 2023 base year emissions inventory and future emissions inventory based on forecasted future conditions.

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LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

ENGINEERING CONSIDERATIONS - COASTAL PROCESSES

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

» How would harbor deepening impact you or resources that are important to you?

» What data or information should be evaluated in the EIS?

» What are some potential benefial use opportunities that may be possible if the project takes place?

» What concerns do you have related to potential impacts to resources?

» Do you have additional data or information?

WAYS TO COMMENT:

Mail:

US Army Corps of Engineers
Wilmington District
ATTN: Wilmington Harbor 403
69 Darlington Avenue
Wilmington, NC 28403

Email:
WilmingtonHarbor403@usace.army.mil

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HYDRODYNAMIC MODELING

- Comprehensive representation of coastal water dynamics

DELFT3D - Hydrodynamic Modeling

Delft3D is a "state of the art" numerical model that will be used to **evaluate current conditions, future without project conditions, and future with project alternatives**. This model will use the historical and future climate information to simulate water movement through the Cape Fear River to evaluate:

- **Water Level Impact**

  - The tidal range at the Wilmington tidal gauge is currently ~5ft. Tidal range impacts from the project will be evaluated for the areas of interest.

  - Water levels will be modeled to identify potential flooding impacts.

- **Channel Velocities**

  - Channel velocities can impact fish migration, shipping traffic, and recreation. Velocities in the Cape Fear River will be analyzed for each alternative to ensure no adverse impacts. A full range of flow patterns ("dry", "normal", and "wet" conditions) will be simulated.

- **Sediment Transport**

  - Suspended and bedload sediment transport will be modeled. This can show changes to the shape of the channel that may occur due to channel modifications. This can also show how often the channel will need to be dredged to maintain the project.

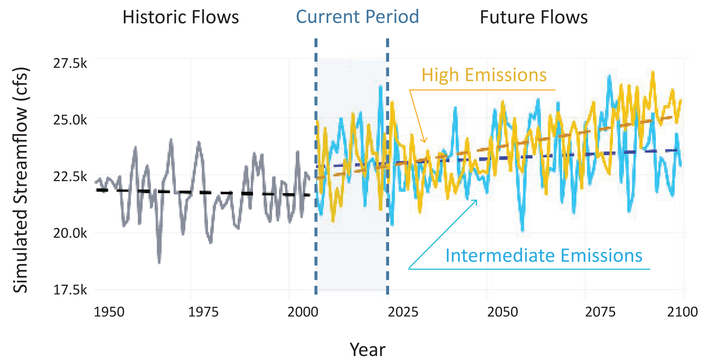
Shoreline Impact

- A Vessel Wake Model will be run to test the alternatives to evaluate ship wake impacts to shorelines or bird island on the Cape Fear River.
- A Wave Transformation Model will be run to look at the changes to waves near the entrance to the Cape Fear River and how they impact the shoreline.

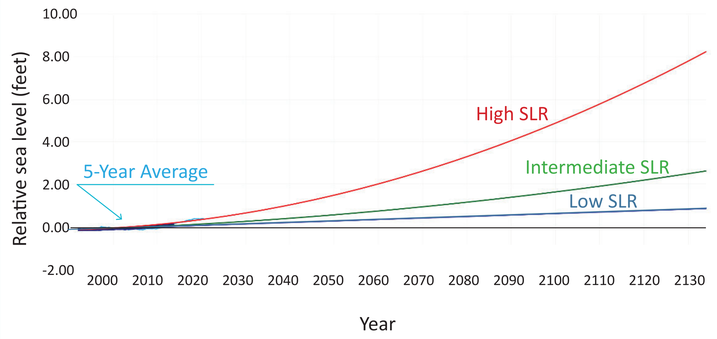
HISTORICAL AND PREDICTED TRENDS: CLIMATE VARIABLES

- Historical and predicted trend in rainfall, river flow, and other climate variables will be evaluated. These variables will be included in the modeling efforts.

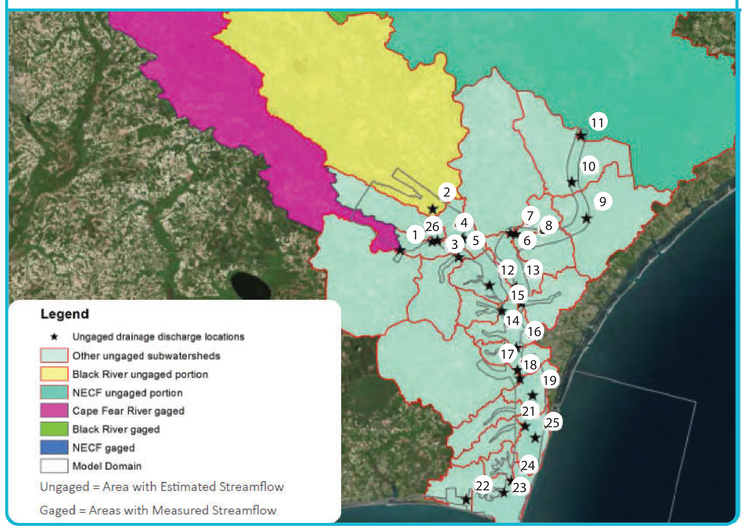
Mean Historic & Future Streamflow Outputs



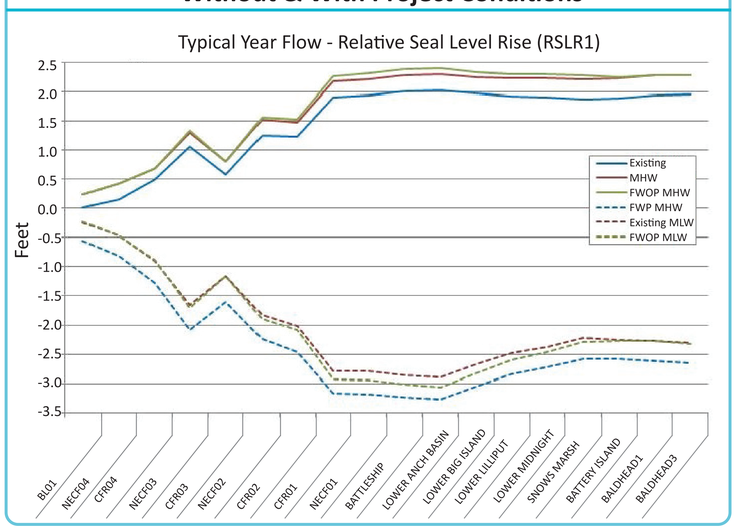
Sea Level Change (SLC)



Cape Fear River Watershed



Water Level Comparison Between Without & With Project Conditions



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LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

COASTAL MODEL

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

- How would harbor deepening impact you or resources that are important to you?
- What data or information should be evaluated in the EIS?
- What questions do you have about hydrodynamics, sediment transport & morphology, or wave transformation?
- What concerns do you have related to hydrology or the model scenarios?
- Do you have data, information, or studies that you can share that would support the evaluation in the EIS?

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DELFT3D COASTAL MODEL

DELFT3D DESCRIPTION.

Integrated, open-source software suite for computing physics of coastal, estuarine, and riverine areas with a Multidimensional (2D/3D) curvilinear grid

COMPONENTS.

- Hydrodynamics (flows)
- Sediment transport & morphology
- Wave transformation
- Water quality

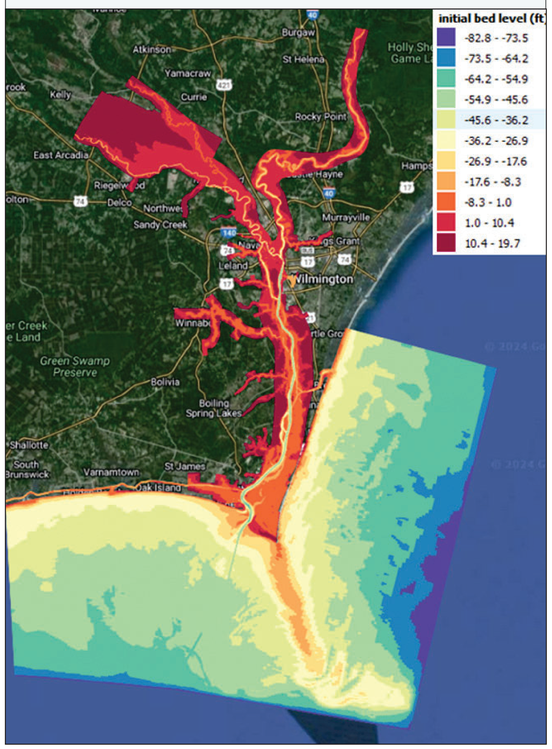
APPLICATIONS.

- Tide and wind-driven flows (storm surge)
- River flows, salt intrusion
- Sediment transport and morphology

DELFT3D CAPABILITIES & ANALYSIS.

- Compare changes to circulation, morphology
- Future without Project, Action Alternative 1 (47 ft Conditionally Authorized Depth), Action Alternative 2
- Temporal resolution 15 min (time series) to 1 hr (map output)
- Spatial resolution 5 m to 90 m, 16 vertical layers
- Varying inflow and Sea Level Change (SLC) regimes, episodic (storm) events
- Tidal range impacts (tide datums, Mean High Water MHW, Mean Low Water MLW, etc.)
- Hurricane velocities and storm surge
- Results in graphical form (2D maps, vertical profiles, time series) Results in tabulated form (tables and spreadsheets of parameters of interest)

COASTAL MODEL CHANNEL - DEPTHS



COASTAL MODEL OUTPUTS

EVALUATE IN-CHANNEL SEDIMENT MOVEMENT

- Cumulative erosion and sedimentation (shoaling)
- Focus on anchorage basin sedimentation
- Include riverine suspended sediment supply
- Parameterize long-term conditions using varying hydrologic conditions and “morphological acceleration” factor in Delft3D

XBEACH MODEL TO EVALUATE VESSEL EFFECTS AT SHORELINE AREAS

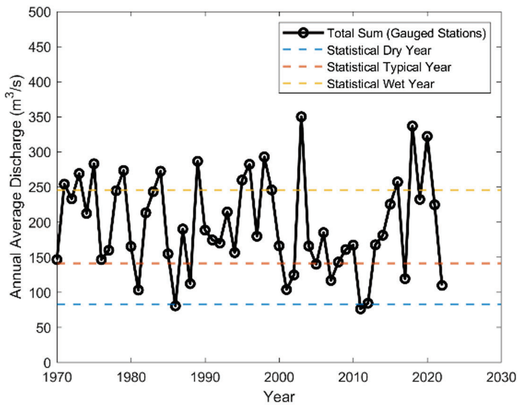
- 2D Vessel wake model that computes changes in sediment transport due to vessel passage, waves, and currents
- Simulate expected future vessel impacts by parameterizing ship as moving wave source
- Phase-resolving wave model (individual wave crests and interactions)
- Compare future alternatives:
- Wave conditions (height, period, direction)
- Peak water levels
- Bed shear stresses

GENCADE.

- 1D shoreline evolution model
- Computes change in shoreline and transport due to waves and currents

COASTAL MODEL BOUNDARY EXTENTS

HYDROLOGY



STATISTICAL YEARS VS. MEASUREMENTS (1970 – 2022)

- Dry Year (25th Percentile)
- Typical Year (50th Percentile)
- Wet Year (75th Percentile)

LOW, INTERMEDIATE, HIGH FLOW REGIMES WITHIN DRY, TYPICAL, AND WET HYDROLOGIC SCENARIOS

- Low – 25th percentile discharge
- Intermediate – 50th percentile discharge
- High – 75th percentile discharge

STORM RUNS

- Florence + low – Hurricane Florence storm surge hydrograph + low flow
- 100 yr + low – 100-yr storm surge hydrograph + low flow
- 500 yr + low – 500-yr storm surge hydrograph + low flow

MODEL SCENARIOS

MODEL SCENARIOS WERE SELECTED TO:

- Model average and “bookend” conditions
- Average year, intermediate flows represents typical conditions
- Dry year, low flow scenarios and high year, wet flow scenarios provides the range of conditions

RUNNING ALL 4 SEA LEVEL CHANGE SCENARIOS:

- Provides temporal insight on conditions occurring between existing conditions and the forecasted conditions

Hydrodynamic, Sediment, and XBEACH | Required Hydrodynamic | X Proposed Water Quality Module Run (WQ, Habitat, Wetland Analysis)

Sea Level Change Projection	Hydrology	FLOW REGIME					
		Low (25%ile)	Int (50%ile)	High (75%ile)	Florence + low	100 yr + low	500 yr + low
No	Dry	X	X	X			
	Typical	X	X	X			
	Wet	X	X	X			
Low	Dry	X	X	X			
	Typical	X	X	X			
	Wet	X	X	X			
Intermediate	Dry	X	X	X			
	Typical	X	X	X			
	Wet	X	X	X			
High	Dry	X	X	X			
	Typical	X	X	X			
	Wet	X	X	X			

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BENEFICIAL USE OF DREDGED MATERIALS

QUESTIONS TO CONSIDER WHEN PROVIDING COMMENTS:

» What strengths can you identify with the current or past beneficial use of dredged materials?

» What are some of the challenges associated with the implementation of beneficial use dredged materials?

» Can you identify any type of opportunites for the beneficial use of the material?

» Do you know of a location that would be ideal for the beneficial use of specific dredged materials?

» After review of the information provided, is there anything missing?

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		CHALLENGES	OPPORTUNITIES	POSSIBLE SEDIMENT TYPES FOR USE
CULTURAL RESOURCE PROTECTION		• Shipwrecks and other archaeological artifacts can degrade, erode, or become strike-damaged if exposed to open water, compromising the physical integrity and cultural significance. • In-situ preservation can include dredged materials.	• Sandbag coverage (Coroneos, 2015) • Reburial • Site stabilization	• Sand (sandbags and reburial) • Rock (stabilization)
SHORELINE PROTECTION		• Ship wake and storms can cause large wave action, wind, and rain to erode existing shorelines	Increasing buffer zones and stabilizing embankments to reduce wave action can significantly decrease shoreline damage from storms and large vessel wake. • Widen beaches • Expand/create natural areas (marshes, mudflats, islands, reefs, etc.) • Add sediment (nearshore wave breaks, feeder berms, habitat creation/expansion, etc.) • Add clay or rock revetments at water's edge to prevent softer soils from erosion	• Sand (beaches, islands, feeder berms) • Rock (base of islands, material containment, shoreline lining, reefs) • Silts & Sand (marshes, mudflats, feeder berms) • Clays (base of placement sites, breakwaters)
HABITAT RESTORATION		• Habitat loss and degredation due to land conversion, develoment, etc.	A variety of habitats associated with coastlines are depended upon by a diverse set of species, many of which are threatened or endangered. These habitats also help to protect the shorelines during storms while serving other ecosystem functions (e.g., filter and improve water quality, serve as refugia, nesting and/or foraging grounds, sea life nurseries, reduce wave energy, expand species diversity, breakwaters, etc.). • Bird islands • Oyster/artificial reefs • Essential fish habitat (seagrass beds, shallows/mudflats, reefs, marshes, etc.) • Marsh systems • Intertidal mudflats • Feeder berms (natural sediment dispersion) • Upland habitat creation	• Sand (bird islands, feeder berms, deep scour holes) • Rock (base of islands, material containment, shoreline lining, reefs) • Silts & Sand (marshes, mudflats, feeder berms, seagrass beds, deep scour holes) • Clays (base of placement sites, feeder berms) • Shells (Oyster reefs, base of placement sites
WETLAND RESILIENCY		• Global climate change is causing sea levels to rise, drowning out low-lying habitat areas. • Consequently, elevations of these areas will need to be raised for these diverse habitats to survive into the coming decades	Adding sand and soils to these and surrounding low-lying areas will increase "elevation capital" to maintain and prepare the valuable ecosystems. This use meets conservation principles Resiliency, Representation, & Redundancy. • Thin- to thick-layer placement (depending on elevation) • Restore & protect lost marsh habitats • Create new areas for marshes to naturally develop • Add buffer habitats such as mudflats	• Rock (material containment, shoreline lining) • Silts & Sand (marshes, mudflats, thick/thin-layer placement, feeder berms) • Clays (base of placement sites, feeder berms)

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LETTER REPORT & ENVIRONMENTAL IMPACT STATEMENT

STATION 1

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STATION 2

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STATION 3

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STATION 4

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COMMENT SUBMITTAL