

**Brunswick Harbor Modifications Study, Glynn County,
Georgia**

**DRAFT Integrated Feasibility Report and Environmental
Assessment and Draft FONSI**

**U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT
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SAVANNAH, GEORGIA 31401**



June 2021

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Executive Summary

The U.S. Army Corps of Engineers, Savannah District (Corps) has prepared this Integrated Feasibility Report and Environment Assessment (IFR/EA), to investigate the feasibility of reducing transportation cost inefficiencies associated with the Federal deep draft navigation channel at Brunswick Harbor, Georgia. The report is authorized by Section 1201 of the Water Resources Development Act (WRDA) 2016. The Corps is undertaking this action in partnership with the Georgia Ports Authority (GPA), the non-Federal sponsor. This IFR/EA identifies a recommended plan for improving navigation that is economically justified and promotes National Economic Development (NED) while protecting the Nation's environment.

The Brunswick Harbor Federal Navigation Channel contains authorized waterways in the outer harbor and the inner harbor. The Port of Brunswick, located in the inner harbor, consists of three terminals for the import and export of various commodities. Colonel's Island Terminal is the focus of this report because it is the largest terminal within Brunswick Harbor and is the destination for all RO/RO traffic in Brunswick Harbor. Additionally, navigation channel widths at specific locations between St. Simons Sound and the Colonel's Island Terminal create navigation and maneuverability issues for the larger RO/RO vessels. RO/RO cargo is wheeled non-containerized freight, such as automobiles and construction equipment.

The Colonel's Island Terminal is the second busiest port in the United States (U.S.) for total RO/RO cargo and busiest for RO/RO imports. The Brunswick Harbor Pilots adhere to guidelines and restrictions for vessel operations depending on RO/RO vessel dimensions and draft. The navigation channel dimensions, and the vessel operation restrictions, result in transportation cost inefficiencies for RO/RO ships calling on Brunswick Harbor. The purpose of the proposed Federal action is to reduce transportation cost inefficiencies experienced by the largest ships utilizing Brunswick Harbor. Therefore, the focus of the feasibility study and plan formulation process is on the parts of the Federal channel used by the RO/RO vessels where they experience navigation difficulties.

The Corps analyzed eight action alternatives and a no action alternative in this report. Common to all alternatives is the continued Operations & Maintenance (O&M) dredging within the entire Federal navigation channel at authorized depths (-36 feet MLLW + 2 feet allowable over-depth). The action alternatives propose channel modifications to improve navigation. Figure ES.1 illustrates the location of proposed modifications for the recommended plan. Modifications considered as part of the study include widening the channel bend near the Cedar Hammock Range (Alt. 2), expanding the turning basin (Alt. 3), widening the channel west of the Sidney Lanier Bridge (Alt. 4), widening the channel at St. Simons Sound (Alt. 5), and combinations of these alternatives (Alt. 6 through Alt. 9). No new work dredging would occur under the No Action Alternative and for Alternative 5. All other action alternatives require dredging. Alternative 8, a combination of Alt. 2, Alt. 3, and Alt. 5 provides the highest average annual equivalent (AAEQ) net benefits among the alternatives and is the National Economic Development

(NED) Plan and the recommended plan. This action generates 2.9 million dollars in average annual equivalent benefits per year over the 50-year period of analysis and has a Benefit-Cost Ratio (BCR) of 4.6. The project first cost for Alternative 8 is \$13,804,000 (FY21). Implementation would be cost shared at a Federal contribution of \$9,084,000 and non-federal sponsor contribution of \$4,830,000¹. The non-Federal sponsor, GPA, supports the recommended plan, Alternative 8, and has no locally preferred plan.

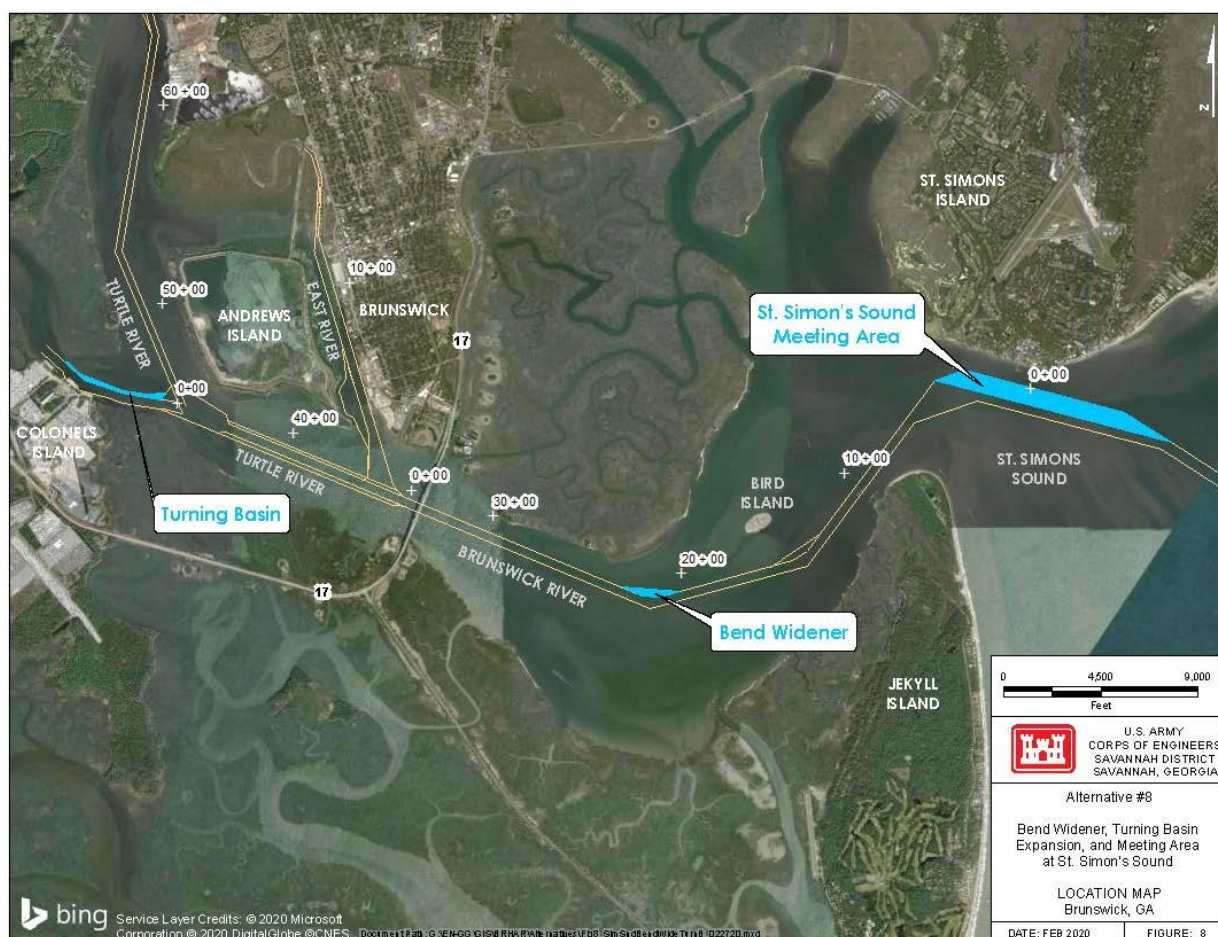


Figure ES.1. Alternative 8 - Bend widener, turning basin expansion, and meeting area at St. Simons Sound. Existing Federal navigation channel denoted by yellow lines with areas of proposed channel widening highlighted in blue.

Implementation of the recommended plan would not result in significant environmental impacts to water quality, existing wetlands, threatened and endangered species, essential fish habitat, terrestrial resources and habitat, aquatic resources and habitat, and other protected resources within the study area. To minimize adverse impacts, the Corps will follow best management practices in its design and operations.

1. The Federal and Non-Federal cost share includes \$110,000 aids to navigation which are a federal cost. Aids to navigation are an economic cost and not included in the certified cost estimate used for construction. See section 5.6 for a full description on the recommended plan cost share.

DRAFT FINDING OF NO SIGNIFICANT IMPACT

Brunswick Harbor Modifications Study, Glynn County, GA Draft Integrated Feasibility Report and Environmental Assessment

The U.S. Army Corps of Engineers, Savannah District (Corps) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The Draft Integrated Feasibility Report and Environmental Assessment (IFR/EA) dated [DATE OF FINAL REPORT], for the Brunswick Harbor Modifications Study, addresses opportunities and feasibility to reduce transportation cost inefficiencies in Brunswick Harbor, which is a deep draft navigation project in Glynn County, Georgia. The final recommendation is contained in the report of the Chief of Engineers, dated [DATE OF SIGNED CHIEF'S REPORT].

The Draft IFR/EA, incorporated herein by reference, evaluated various alternatives that would reduce transportation cost inefficiencies experienced by the largest ship type utilizing Brunswick Harbor. Alternative 8, the recommended plan, is the National Economic Development (NED) Plan and includes:

- Expansion of the Cedar Hammock Range bend widener located between stations 20+300 to 23+300. The bend widener will be expanded by a maximum of 321 feet on the north side and at a length of approximately 2,700 feet. The bend widener will be dredged to a depth of -38 feet MLLW (-36 feet MLLW plus 2 feet of allowable over-depth). Approximately 205,000 cubic yards of material will need to be dredged to expand the bend widener. All dredged material will be placed in the Andrews Island Dredged Material Containment Area (DMCA).
- Expansion of the turning basin at Colonel's Island Terminal along approximately 4,100 feet, increasing the width by a maximum of 395 feet along South Brunswick River from stations 0+900 to 5+300. The turning basin expansion will be dredged to a depth of -38 feet MLLW (-36 feet MLLW plus 2 feet of allowable over-depth). The turning basin expansion will require approximately 346,000 cubic yards of dredged material to be removed. All dredged material will be placed in the Andrews Island DMCA.
- Creation of a RO/RO vessel meeting area located at St. Simons Sound near the Brunswick Harbor entrance channel. No dredging is required since the area has naturally deep water. Creation of a meeting area at St. Simons Sound will relocate the north toe of the existing channel approximately 800 feet to the north along a length of approximately 10,000 feet from stations -6+800 to 4+300. The existing channel centerline will not change.
- Incorporation of the South Atlantic Regional Biological Opinion for Dredging and Material Placement Activities in the Southeast United States (2020 SARBO) into

Operations and Maintenance of the Brunswick Harbor Federal Navigation Project.

In addition to a “no action” plan, eight action alternatives were evaluated. The “no action” plan, would mean continuing standard operations and maintenance at Brunswick Harbor with no improvements to the Federal navigation channel, and in accordance with the 1997 SARBO. The final array of alternatives, described and compared in Section 3.7 of the report, included: Alternative 2: expansion of the Cedar Hammock Range bend widener located between stations 20+300 to 23+300; Alternative 3: expansion of the existing turning basin at the Colonel’s Island Terminal along approximately 4,100 feet increasing the width by a maximum of 395 feet along South Brunswick River from stations 0+900 to 5+300; Alternative 4: creation of a RO/RO vessel meeting area upstream of the Sidney Lanier Bridge to the turning basin at the Colonel’s Island Terminal (a distance of approximately 8,700 feet); Alternative 5: creation of a RO/RO vessel meeting area located at St. Simons Sound near the entrance channel to Brunswick Harbor; Alternative 6: combination of the bend widener (Alternative 2) and the turning basin expansion (Alternative 3); Alternative 7: combination of the bend widener (Alternative 2), turning basin expansion (Alternative 3), and meeting area west of the Sidney Lanier Bridge (Alternative 4); Alternative 8: combination of the bend widener (Alternative 2), turning basin expansion (Alternative 3), and meeting area at St. Simons Sound (Alternative 5); Alternative 9: combination of the bend widener (Alternative 2), turning basin expansion (Alternative 3), meeting area west of the Sidney Lanier Bridge (Alternative 4), and meeting area at St. Simons Sound (Alternative 5). Common to all action alternatives was the incorporation of the 2020 SARBO into the continued operations and maintenance of the federal navigation channel.

For all alternatives, including continued operations and maintenance of the federal navigation channel, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the recommended plan and O&M action alternative are listed in Table 1:

SUMMARY OF POTENTIAL EFFECTS:

Table 1: Summary of Potential Effects of the Draft Recommended Plan

	Insignificant effects	Insignificant effects as a result of mitigation*	Resource unaffected by action
Aesthetics	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Air quality	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aquatic resources/wetlands	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Invasive species	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Fish and wildlife habitat	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Threatened/Endangered species/critical habitat	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Historic properties	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Other cultural resources	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Floodplains	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Hazardous, toxic & radioactive waste	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Hydrology	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Navigation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Noise levels	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Socio-economics	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Environmental justice	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Tribal trust resources	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Water quality	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. Best management practices (BMPs) as detailed throughout the draft IFR/EA will be implemented, if appropriate, to minimize impacts.

Mitigation (avoidance and minimization) applicable to Threatened/Endangered species/critical habitat (Endangered Species Act of 1973 (ESA)) includes, but is not limited to, the following:

- Adherence to the appropriate 2020 SARBO Project Design Criteria (PDCs)(Section 4.5 and Appendix B of the 2020 SARBO). The PDC are “specific criteria, including the technical and engineering specifications, indicating how an individual project must be sited, constructed, or otherwise carried out both to be covered under this Opinion [2020 SARBO] and to avoid or minimize adverse effects to ESA-listed species or designated critical habitat” (2020 SARBO, page 13).

- In the event of an encounter from a protected marine mammal species, contractors will observe BMPs and will remain informed of the civil and criminal penalties for harming, harassing, or killing species, which are protected under the ESA and/or the Marine Mammal Protection Act of 1972.

Mitigation (avoidance and minimization) for the National Historic Preservation Act of 1996 (NHPA) includes, but is not limited to, the following:

- Any potential mitigation associated with impacts to historic properties and other cultural resources will be mitigated as a part of the Programmatic Agreement (PA) to ensure compliance with Section 106 of the NHPA. The PA will allow any mitigation to be completed if impacts to historic properties and other cultural resources are unavoidable.

COMPENSATORY MITIGATION:

No compensatory mitigation is required as part of the recommended plan.

Any potential mitigation associated with impacts to cultural resources will be mitigated as a part of the Programmatic Agreement (PA) to ensure compliance with Section 106 of the National Historic Preservation Act of 1996, as amended (NHPA). The PA will allow any mitigation to be completed if impacts to historic properties are unavoidable.

PUBLIC REVIEW

Public review of the draft IFR/EA was completed on July 9, 2020. No significant public comments were received. A copy of the comments received, as well as a summary matrix of the comments and Corps responses, can be found in Appendix F of the IFR/EA.

OTHER ENVIRONMENTAL AND CULTURAL COMPLIANCE REQUIREMENTS:

ENDANGERED SPECIES ACT

FORMAL CONSULTATION:

Pursuant to section 7 of the ESA, the National Marine Fisheries Service issued the 2020 SARBO, dated July 31, 2020, that determined that operations and maintenance dredging and other covered activities will not jeopardize the continued existence of the ESA-listed species in the action area. The 2020 SARBO is a programmatic opinion that considers effects to the following species: sea turtles (Kemp's Ridley, green, hawksbill, leatherback, and loggerhead), sturgeon (shortnose and Atlantic), Nassau grouper, Giant manta ray, scalloped hammerhead shark, smalltooth sawfish, oceanic whitetip shark, whales (North Atlantic right, Blue, Fin, Sei, and Sperm), Johnson's seagrass, and corals (Boulder star, elkhorn, Lobed star, Mountainous star, Pillar, rough cactus, and staghorn). The 2020 SARBO, which replaced the sea turtle centric 1997 SARBO, is a multi-species approach that covers all dredging techniques in federal waters in the Southeast from North Carolina/Virginia border south to the U.S. Virgin Islands. As such,

restrictions on the timing of actions reflect a balancing of the risk to all ESA-listed species. All project design criteria, terms and conditions, conservation measures, and reasonable and prudent alternatives and measures resulting from these consultations shall be implemented in order to minimize take of endangered species and avoid jeopardizing the species.

INFORMAL CONSULTATION

Pursuant to section 7 of the ESA, the National Marine Fisheries Service issued a Letter of Concurrence, dated May 24, 2021, that determined that the modification (new work) may affect, but is not likely to adversely affect ESA-listed species. It also considered that future maintenance dredging and dredged material placement may then be covered under the 2020 SARBO. This consultation accordingly evaluates those portions and effects of the project not analyzed in 2020 SARBO and incorporates the 2020 SARBO by reference for analysis of effects to ESA-listed species and designated critical habitat resulting from future maintenance of the modified channel in Brunswick Harbor. The Letter of Concurrence evaluated effects to sea turtles (Kemp's Ridley, green, hawksbill, leatherback, and loggerhead), sturgeon (shortnose and Atlantic), and Giant manta ray. A no effect determination was made for all other species with the potential to occur in the action area of the new work dredging (recommended plan). There is no designated critical habitat in the project location. All project design criteria (from the 2020 SARBO), terms and conditions, conservation measures, and reasonable and prudent alternatives and measures resulting from these consultations shall be implemented in order to minimize take of endangered species and avoid jeopardizing the species.

Pursuant to section 7 of the ESA, the U.S. Fish and Wildlife Service concurred with the Corps effects determination, dated June 18, 2020, that determined that the recommended plan and ongoing O&M will not jeopardize the continued existence of the West Indian manatee. A no effect determination was made for all other species with the potential to occur in the action area. There is no designated critical habitat in the project location. All terms and conditions, conservation measures, and reasonable and prudent alternatives and measures resulting from these consultations shall be implemented in order to minimize take of endangered species and avoid jeopardizing the species.

NATIONAL HISTORIC PRESERVATION ACT

Pursuant to Section 106 of the NHPA, a Programmatic Agreement (PA) between the Corps and the Georgia Historic Preservation Division was executed on October 14, 2020 for this project. Pursuant to 54 U.S.C. 306108, 36 CFR 800.4(b)(2), and 36 CFR 800.14(b)(1)(ii), the Corps is deferring final identification and evaluation of historic properties until after project approval, additional funding becomes available, and prior to construction through the execution of this PA. This agreement includes Phase I investigations to identify archaeological sites and shipwrecks in areas previously not surveyed where dredging will occur, including a buffer for mooring and anchoring and side-slopes. Any resources found during the surveys will be evaluated for inclusion on the NRHP. Mitigation would be required for NRHP-eligible resources if the project impacts are unavoidable. Previously recorded historic properties that might be impacted

would be mitigated if avoidance is not possible. Surveys will be conducted to relocate the two anomalies in the turning basin, as well as diver investigations of the anomalies to determine if they are significant cultural resources. The PA can be found in Appendix H of the IFR/EA.

CLEAN WATER ACT SECTION 404(B)(1) COMPLIANCE

Pursuant to the Clean Water Act of 1972, as amended, the discharge of dredged or fill material associated with the recommended plan has been found to be compliant with section 404(b)(1) guidelines. The Clean Water Act Section 404(b)(1) evaluation is found in Appendix K of the IFR/EA.

CLEAN WATER ACT SECTION 401 COMPLIANCE

A Water Quality Certification pursuant to Section 401 was issued dated October 26, 2020, by the Georgia Department of Natural Resources, Environmental Protection Division. All conditions of the Water Quality Certification will be implemented to minimize adverse impacts to water quality.

COASTAL ZONE MANAGEMENT ACT

On April 23, 2021, GADNR - CRD provided conditional concurrence to Corps' CZMA consistency determination for the Brunswick Harbor Modifications Study (BHMS). The Corps found the conditions unacceptable and views GA-DNR CRD conditional occurrence as an objection. The Corps is consistent to the maximum extent practicable with the enforceable policies of the management program, without accepting GA-DNR's conditions. On May 21, 2021, the Corps informed GADNR-CRD of the Corps decision to not accept the conditions as required in 15 C.F.R. § 930.43(e). Additional information can be found in Section 6 of the IFR/EA.

OTHER APPLICABLE ENVIRONMENTAL COMPLIANCE

Pursuant to the Fish and Wildlife Coordination (FWCA) Act of 1934, on May 20, 2020, the USFWS provided the Corps with the final FWCA Evaluation Report, which has been incorporated into the IFR/EA. USFWS found no significant effects to species under their jurisdiction. The final FWCA Evaluation can be found in Appendix K of the IFR/EA.

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), NMFS responded by letter dated July 8, 2020 and provided no conservation recommendations, therefore the substantive requirements of the MSA have been met. The MSA correspondence letter can be found in Appendix I of the IFR/EA.

All applicable environmental laws have been considered and coordination with appropriate agencies and officials has been completed. This information can be found in Section 6.0 as well as 7.0 of the draft IFR/EA.

Technical, environmental, economic, and cost effectiveness criteria used in the formulation of alternative plans were those specified in the Water Resources Council's

1983 Economic and Environmental Principles and Guidelines for Water and Related
Land Resources Implementation Studies.

Date

Joseph R. Geary, PhD, PE
Colonel, U.S. Army
Commanding

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This report includes an Environmental Assessment integrated into the Main Report that complies with requirements of the USACE and the Council of Environmental Quality (CEQ) and reduces duplication and paperwork.

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ACRONYMS

Acronyms	Definition
AAEQ	Average Annual Equivalent
ACHP	Advisory Council on Historic Preservation
AIWW	Atlantic Intercoastal Waterway
APE	Area of Potential Effects
BCR	Benefit-to-Cost Ratio
BMP	Best Management Practices
CAA	Clean Air Act
CAGR	Compound Average Growth Rate
CEQ	Council of Environmental Quality
CEU	Car-Equivalent Units
CFR	Code of Federal Regulations
CHL	Coastal Hydraulics Lab
CIMC	Cleanups in My Community
CMPA	Coastal Marsh Protection Act
CO	Carbon monoxide
CWA	Clean Water Act
DMCA	Dredged Material Containment Area
DO	Dissolved Oxygen
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	United States Environmental Protection Agency
EPB	Environmental Protection Barrier
GADNR - EPD	Georgia Department of Natural Resources Environmental Protection Division
EQ	Environmental Quality
ER	Engineer Regulation
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCSA	Feasibility Cost Share Agreement
FONSI	Finding of No Significant Impact
FWCA	Fish and Wildlife Coordination Act
FWOP	Future Without Project Condition Alternative
GADNR - CRD	Georgia Department of Natural Resources Coastal Resources Division
GADNR	Georgia Department of Natural Resources
GADNR – WRD	Georgia Department of Natural Resources Wildlife Resource Division
GADOT	Georgia Department of Transportation
GADPH	Georgia Department of Public Health
GA HPD	Georgia Historic Preservation Division

GNAHRGIS	Georgia's Natural, Archaeological and Historic Resources GIS
GPA	Georgia Ports Authority
HAPC	Habitat Area of Particular Concern
HDD	Horizontal Directional Drilling
HERO	High Efficiency Roll-on/Roll-off
HTRW	Hazardous, Toxic, and Radioactive Waste
IFR	Integrated Feasibility Report
IPAC	Information, Planning, and Conservation System
IWR	Institute for Water Resources (USACE)
LCTC	Large car and truck carriers
LER	Lands, easements, and rights-of way
LERRD	Lands, easements, rights-of-way, relocations and disposal areas
MHHW	Mean higher high water
MISLE	Marine Information for Safety and Law Enforcement (USCG)
MLLW	Mean lower low water
MLW	Mean Low Water
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAA	No Action Alternative
NAAQS	National Ambient Air Quality Standards
NED	National Economic Development
NEPA	National Environmental Policy Act
NFS	Non-Federal Sponsor
NHPA	National Historic Preservation Act
NMFS	U.S. Department of Commerce National Marine Fisheries Service
NRHP	National Register of Historic Places
NTU	Nephelometric Telemetry Units
NWI	National Wetlands Inventory
OSE	Other Social Effects
PA	Programmatic Agreement
PAL	Planning Aid Letter
PAR	Planning Aid Report
PCTC	Pure car and truck carriers
PED	Preconstruction, Engineering, and Design
PPP	Previous Post-Panamax
RED	Regional Economic Development
RNA	Regulated Navigation Area
ROM	Rough Order of Magnitude
RO/RO	Roll-on/Roll-off
SAFMC	South Atlantic Fishery Management Council
SERIM	Southeast Regional Implementation Manual
SLC	Sea level change
SLR	Sea level rise
THPO	Tribal Historic Preservation Officer
TRI	Toxics Release Inventory
TSP	Tentatively Selected Plan

US	United States
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
WQC	Water Quality Certification
WRDA	Water Resources Development Act

Brunswick Harbor Modifications Study, Glynn County, GA

1. Introduction

The U.S. Army Corps of Engineers, Savannah District (the Corps) has prepared the Brunswick Harbor Modifications Study: Integrated Feasibility Report and Environmental Assessment (IFR/EA) to document the evaluation of navigation channel modifications in Brunswick Harbor from St. Simons Sound to the Colonel's Island Terminal. This report documents the planning process for navigation improvements consistent with Corps planning policy and with the Council on Environmental Quality (CEQ) implementing regulations for the National Environmental Policy Act (NEPA). CEQ amended its regulations implementing NEPA on September 14, 2020. The amended regulations provided agencies with the discretion to apply the amended regulations to NEPA processes that started before September 14, 2020 (40 CFR § 1506.13). The Corps initiated its NEPA process on May 17, 2019 and solicited public comments on June 9, 2020; therefore, the prior CEQ regulations continue to apply to this report.

1.1. Purpose and Need for Improvement Project

The goal of the proposed Federal action (i.e. the navigation improvement project) is to improve navigation into and out of the Port of Brunswick for RO/RO vessels using the Colonels Island Terminal now and in the future to achieve transportation cost savings (increased economic efficiencies).

Harbor pilots and the Georgia Ports Authority have identified navigational challenges in Brunswick Harbor. Inadequate channel width has been identified as a problem in the inner harbor portion of the Brunswick Federal channel. Operational inefficiencies created by inadequate channel width results in economic inefficiencies that translate into costs for the national economy. The outer harbor has adequate channel width and depth for RO/RO traffic. Once RO/RO vessels navigate to the inner harbor they must wait for favorable tides in order to navigate the parts of the inner harbor with narrow channel widths. Colonels Island Terminal, the RO/RO vessel destination, is at the western end of the inner harbor channel. The economic analysis is anticipated to demonstrate National Economic Development (NED) benefits, e.g. reduced navigation cost with an improvement project.

The purpose of the Federal Action is to improve transportation maneuverability for the RO/RO vessels that call on the Port of Brunswick. There is a need for harbor improvements since RO/RO vessels are experiencing transportation inefficiencies between St. Simons Sound and Colonel's Island Terminal.

The purpose of this deep draft navigation report is to evaluate alternatives for improving navigation for RO/RO vessels utilizing Brunswick Harbor; and thereby reducing transportation cost inefficiencies. The Corps has developed a range of reasonable action alternatives and evaluated them in comparison to the No Action

Alternative/Future Without-Project condition alternative (NAA/FWOP). Action alternatives include a range of channel modifications.

The Federal Action also includes the continued Operation and Maintenance (O&M) of the Brunswick Harbor Federal Navigation Project, which includes both existing and any new work O&M within the entirety of the 30 miles of navigation channels.

1.2. Study Authority and Non-Federal Sponsor

The study authority is Section 1201 of WRDA 2016, which reads:

“The Secretary is authorized to conduct a feasibility study for the following projects for water resources development and conservation and other purposes, as identified in the reports titled “Report to Congress on Future Water Resources Development” submitted to Congress on January 29, 2015, and January 29, 2016, respectively, pursuant to section 7001 of the Water Resources Reform and Development Act of 2014 (33 U.S.C. 2282d) or otherwise reviewed by Congress:

(12) BRUNSWICK HARBOR, GEORGIA. — Project for navigation, Brunswick Harbor, Georgia.”

The “Report to Congress on Future Water Resources Development (February 2016)” identified a need to study modifying the existing Federal navigation project in Brunswick Harbor specifically at the bend widener and Colonel’s Island turning basin location for the purpose of improving navigation.

Georgia Ports Authority (GPA) is the Non-Federal Sponsor (NFS). As the NFS, GPA contributes 50 percent of the total feasibility study costs in the form of cash or in-kind contributions. A feasibility cost share agreement was executed on April 11, 2019.

1.3. Harbor Location and Study Area

Brunswick Harbor is located in the southeastern section of Glynn County, Georgia, adjacent to the City of Brunswick and includes the inner channels through St. Simons Sound, Brunswick River, Turtle River, and the East River to the Colonel’s Island Terminal (Figure 1 and Figure 3). The inner channels are authorized to a depth of -36 feet mean lower low water (MLLW) +2 feet allowable overdepth and at a width of 400 feet (ft).

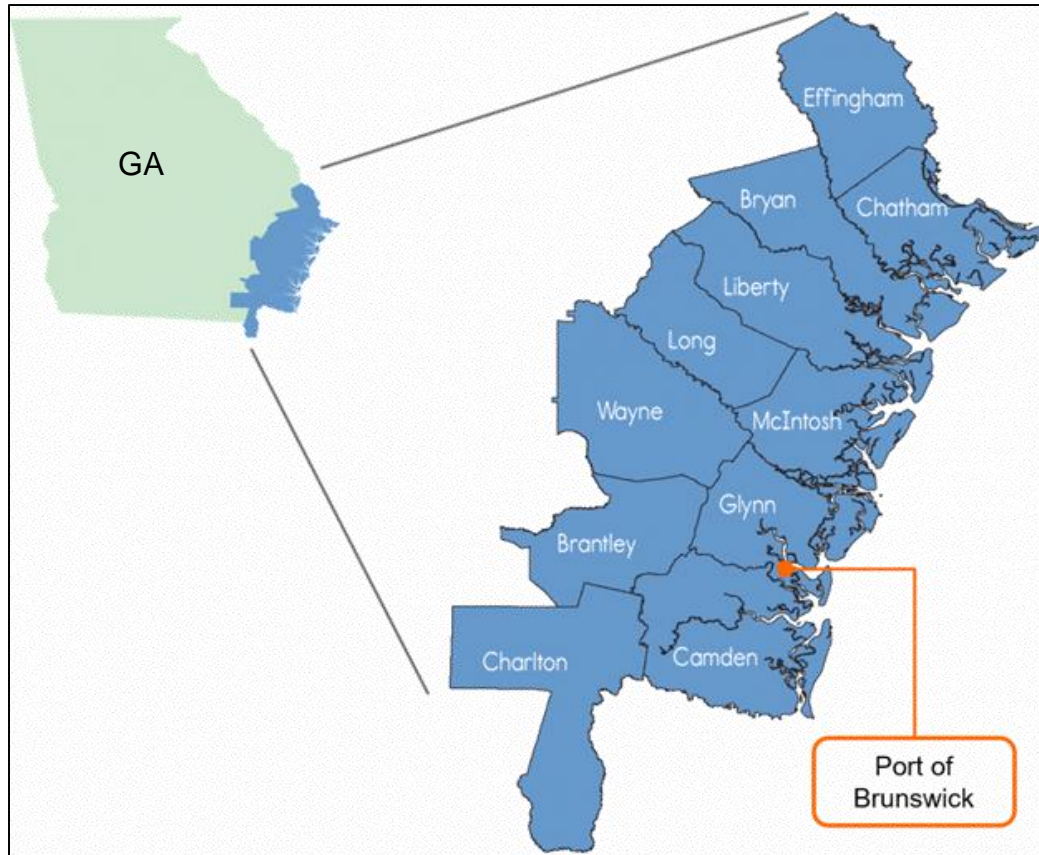


Figure 1. Port of Brunswick Location

As the westernmost port on the U.S. Eastern seaboard, the Port of Brunswick is a natural gateway to move cargo to the large population centers in the Southeast. Specifically, the Colonel's Island Terminal is within 2.5 miles of Interstate 95 (I-95) and is also served by two Class 1 railroads (Figure 2).



Figure 2. Port of Brunswick Railway Connections

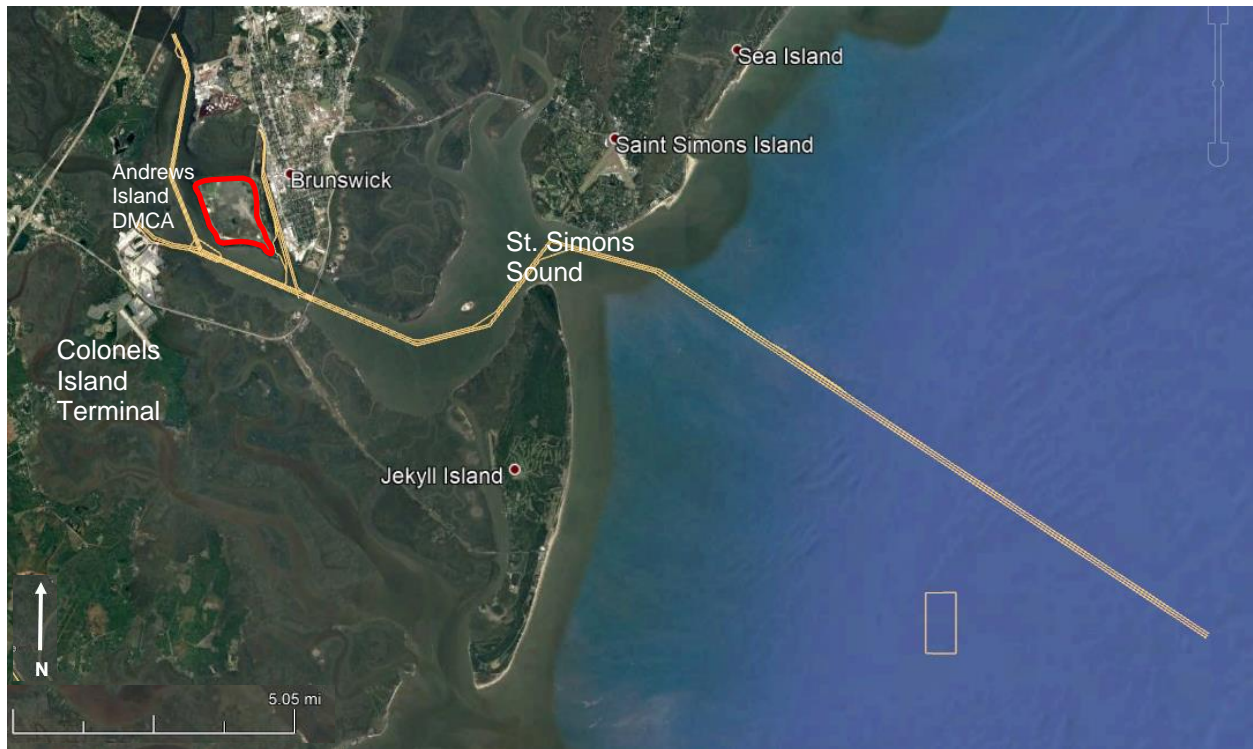


Figure 3. Brunswick Harbor with the Federal navigation channel identified in yellow. The yellow square in the ocean is the ocean disposal site for dredged material. An additional disposal site, Andrews Island DMCA is outlined in red.

The study area for plan formulation to examine modifying the current footprint of the Federal channel is the Brunswick River and Turtle River located between St. Simons Sound and Colonels Island Terminal, where RO/RO vessels transit (Figure 3). This is the part of the Federal channel where RO/RO vessels are experiencing navigation difficulties. The Brunswick Harbor Federal Channel located within the East River and Turtle River north of the turning basin were excluded from the plan formulation study area since RO/ROs do not use these areas. For the purposes of NEPA compliance, the study area is the entire Brunswick Federal channel located in yellow on Figure 3.

1.4. Harbor Location and Study Area

Brunswick Harbor is a nationally significant port and a critical regional and national gateway. It consists of three shipping terminals. Two of the terminals, Mayor's Point and East River are located along the East River near downtown Brunswick. Smaller vessels (less than 40,000 dead weight tons) service these two terminals. The Mayor's Point Terminal specializes in paper and pulp products. The main commodity shipped from the East River Terminal is wood pellets, while commodities received include fertilizers, salt from the Bahamas, perlite, kitty-litter, and bulk liquids.



Figure 4. Brunswick Harbor Terminals

Colonel's Island Terminal is the largest terminal in Brunswick Harbor and the largest automobile port in the Nation, with 610 acres of paved open storage and an additional 478 acres permitted for development. It is a dedicated "Roll-on/Roll-off" (RO/RO) facility and accommodates the largest vessels that call at the Port of Brunswick. It is the second busiest port in the U.S. for total RO/RO cargo and the busiest for RO/RO imports. It handles all of Brunswick Harbor's RO/RO traffic, which is wheeled non-containerized freight, such as automobiles and construction equipment. Colonel's Island Terminal is located along the Turtle River at the western end of the Brunswick Federal Channel.

Colonel's Island Terminal is the focus of the feasibility study, as commodities that transit through Colonel's Island are of primary interest. In Fiscal Year 2018, over 629,000 combined auto/machinery units moved through the Colonel's Island Terminal for receipt or shipment (GPA, 2019). This translates into almost one million metric tons of vehicles and parts moved. With both auto manufacturing and sales experiencing a difficult year in 2020 related to the pandemic, RO/RO cargo totaled over 600,000 units for the year at

Colonel's Island, a decrease of 8 percent. However, momentum has increased in recent months, with RO/RO trade between August and December 2020 up 15,000 units compared to the same period in 2019.

Colonel's Island Terminal has an annual throughput capacity of over 800,000 Car-Equivalent Units (CEUs). Ongoing expansion projects at Colonel's Island Terminal are expected to add to this capacity with an additional berth and landside infrastructure improvements which are projected to be completed in the next ten years. Given forecasted vehicle growth during the study period, the Port of Brunswick is not expected to exceed future capacity estimates of approximately 1.5 million CEUs by the end of the 50-year period of analysis.

Currently, Colonel's Island Terminal offers three RO/RO berths with an overall length of 3,355 feet at a depth of 36 feet (Figure 5) and is served by nine steamship lines. The port services more than 60 automobile and heavy equipment manufacturers. Three on-terminal auto processors, seven automobile manufacturers, and two marine terminal operators reside on Colonel's Island Terminal.



Figure 5. Colonel's Island Terminal looking southwest.
Source: Georgia Ports Authority

Colonel's Island Terminal Expansion

The current capacity at Colonel's Island Terminal is 90,000 automobile parking spaces. Full build-out will provide 1,102 acres for automobile processing, an additional rail yard on the south side of the terminal, and a fourth RO/RO berth, for an annual capacity of approximately 1.5 million vehicles.

1.5. Existing Federal Navigation Project

The Brunswick Harbor Federal Navigation Project is identified in yellow in Figure 3. The authorized project consists of approximately 30 miles of Federally authorized channel. Operations and maintenance (O&M) activities occur on an annual basis depending on need and funding availability. The Federal navigation channel is comprised of an inner harbor and entrance channel. The entrance channel is located in open water and extends to St. Simons Sound. The inner harbor extends west from St. Simons Sound upriver. The currently authorized maintenance depth of the entrance channel is -38 feet MLLW +2 feet allowable overdepth.

Currently, the average annual quantity of O&M material dredged in Brunswick Harbor is approximately 1.6 million cubic yards. This amount includes approximately 390,000 cubic yards in the inner harbor reach and 1,219,000 cubic yards in the outer harbor, or entrance channel, through various dredging methods. Dredging methods used in the Brunswick Harbor Federal Navigation Channel are described below. The general descriptions of the dredging methods and equipment are the same as those presented in the 2020 South Atlantic Regional Biological Opinion for Dredging and Material Placement Activities in the Southeast United States (2020 SARBO). Specific information for Brunswick Harbor has been added in the below descriptions. The 2020 SARBO descriptions are presented here as they are used in the analysis of effects from dredging activities.

Hydraulic Dredge Types

Hopper

The hopper dredge, or trailing suction hopper dredge, is a self-propelled ocean-going vessel with a section of the hull compartmented into 1 or more hoppers. Hopper dredges use suction to pump sediment from the surface of the seafloor through long intake pipes, called dragarms, and store it in the hoppers. When the vessel is full, dredging stops and the vessel sails to the dredged material placement site (2020 SARBO). In Brunswick Harbor, the placement site is the Ocean Dredged Material Disposal Site (ODMDS). Dredged material is discarded from the bottom of the hopper dredge into the ODMDS.

Hopper dredges are well suited to dredging heavy sands but can also handle clays, silts, or gravel. They can work in relatively rough seas and because they are mobile, they can be used in high-traffic areas (2020 SARBO). For these reasons, hopper dredging is the preferred method of maintenance dredging in the Entrance Channel.

Hopper dredges also have several limitations. Considering their normal operating conditions, hopper dredges cannot dredge continuously unlike other dredge types that continue to work and transfer dredged material to another location. Hopper dredges must stop dredging while transporting materials to the final destination. The precision of hopper dredging is lower than other types of dredges; therefore, they have difficulty dredging steep side banks and cannot effectively dredge around structures (2020

SARBO). This makes hopper dredging impractical for a more confined channel with structures, such as the Inner Harbor.

The Corps implements several measures to minimize the risk of incidental take of ESA-listed species during hopper dredging, as shown in the SARBO, section 2.5.2.2.1: Dredges use draghead deflectors, which produce a sand wave while the dragheads operate on the seafloor to move any species away from the draghead's suction; all pumps are disengaged when not on the seafloor to reduce species entrainment; and screens are placed on and around the dragheads and inflow boxes (where sediment enters the hopper) to also reduce entrainment (SARBO, section 2.5.2.2.2). Furthermore, protected species observers monitor hopper dredging at all times. The Corps has also developed the Operations and Dredging Endangered Species System (ODESS), a data collection and decision-making tool to measure impacts of hopper dredging activities to ESA-listed species and to assist other agencies in the evaluation of this data. In accordance with the 2020 SARBO, the Corps uses ODESS as its "primary reporting system...to store and monitor dredging project data including information associated with encounters with ESA-listed species." (SARBO, p. 72).

Cutterhead

Cutterhead pipeline dredges are designed to handle a wide range of materials including clay, hardpan, silts, sands, gravel, and some types of rock formations without blasting. This makes them suitable for new work and maintenance in projects where suitable placement/disposal areas are available, operating in an almost continuous dredging cycle resulting in maximum production, economy, and efficiency (2020 SARBO).

A cutterhead is a mechanical device that has rotating blades or teeth to break up or loosen the bottom material so that it can be sucked through the dredge pipeline. Cutterhead pipeline dredges are rarely self-propelled, and typically must be transported to and from the dredge site where they are secured in place by special anchor pilings, called spuds. Cutterhead pipeline dredges are capable of dredging in shallow or deep water and have accurate bottom and side slope cutting capability. They require an extensive array of support equipment including pipeline (floating, shore, and submerged), boats (crew, work, survey), barges, and pipe handling equipment. Most cutterhead pipeline dredges have a cutterhead on the suction end.

Limitations of these dredges include relative lack of mobility, long mobilization and demobilization, inability to work in high wave action and currents, and they are impractical in high traffic areas.

Cutterhead dredging is most suitable for both the proposed modifications and maintenance dredging in the Inner Harbor. The proximity of Andrews Island DCMA to reaches in the Inner Harbor make it possible to direct pump material through a pipeline into Andrews Island DMCA. Due to constraints for placement of dredged material in the ODMDS, any material from cutterhead dredging that is suitable for placement in the ODMDS require the cutterhead to pipe material into a scow/barge and then transport to the ODMDS for bottom dump.

Mechanical Dredge Types

Mechanical dredges remove material by scooping it from the bottom and then placing it onto a waiting barge or scow, or directly into a placement/disposal area. Mechanical dredges work best in consolidated, or hard-packed, materials and can be used to clear rocks and debris. Dredging buckets have difficulty retaining loose, fine materials, which can be washed from the bucket as it is raised. Special buckets have been designed for controlling the flow of water and material from buckets and are used when dredging contaminated sediments. Mechanical dredges are rugged and can work in tightly confined areas. They are mounted on a large barge and are towed to the dredging site and secured in place by anchors or spuds. They are often used in harbors, around docks and piers, and in relatively protected channels, but are not suited for areas of high traffic or rough seas. These dredges can generate relatively large amounts of turbidity as the bucket traverses the water column (2020 SARBO).

Clamshell

Clamshell (aka bucket) dredges, named for the scooping buckets they employ, are the most common type of mechanical dredge. A clamshell dredge begins the digging operation by dropping the bucket in an open position from a point above the sediment. The bucket falls through the water and penetrates into the bottom material. The sides of the bucket are then closed, and material is sheared from the bottom and contained in the bucket compartment. The bucket is raised above the water surface, swung to a point over the barge, and then released into the barge by opening the sides of the bucket. The barge then transports the material to the appropriate placement site. Clamshell dredging creates irregularities in the sediment bottom, and bed levelling is often required as final clean-up (2020 SARBO).

Bed-Levelling

A “bed-leveler” is considered to be any type of dragged device used to smooth sediment bottom irregularities left by a dredge. It is also referred to as a “mechanical leveling device or drag bar”. Typically, a bed-leveler consists of a large customized plow, I-beam, or old spud that is slowly dragged across the sediment. In Brunswick Harbor they are used to smooth out peaks and trenches during the final cleanup phase of the dredging activity. Bed-leveling used during the final/clean up phase of dredging is done by dragging the drag bar to knock down and even out the bottom sediment caused by other forms of dredging. Special attention must be paid to the design of a bed-leveler, and how it connects to the chains used to drag it in order to not create pinch points where an animal can be impinged. The “Brunswick design” and other bed leveler designs create a “sand wave” which causes ESA-listed species to move away from the equipment and reduce risk of injury (2020 SARBO).

Brunswick Harbor Dredged Material Placement Sites

Andrews Island Dredged Material Containment Area (DMCA)

The Andrews Island DMCA is an existing confined disposal area located in the southeastern section of Glynn County, Georgia. It is approximately 770 acres and surrounded by four miles of containment dikes and is actively used for placement of material from maintenance of the federal navigation channel. Dredged material is periodically removed by local and state agencies for use as fill in construction and maintenance activities. The Glynn County Public Works Department has used the fill material as a base for roads and parking lots and as material to build up the shoulders of roads. Georgia Department of Transportation has also used the dredged material in its road construction and maintenance activities. The last dike improvement was performed by the Corps of Engineers in 2009 and the current remaining capacity is 15,568,347 cubic yards (CY), according to the most recent survey, performed in November 2019. Location of Andrews Island is shown in Figure 3.

Brunswick ODMDS

In 1989, the U.S. Environmental Protection Agency (EPA) designated the Brunswick ODMDS as an approved material placement site. The ODMDS encompasses an area of 2.0 square nautical miles (NM) within a 1.0 by 2.0 NM rectangular site. A site monitoring and management plan (SMMP) for the Brunswick Harbor, pursuant to the Marine Protection, Research, and Sanctuaries Act (MRPSA) of 1972 was updated in 2013 and is effective for 10 years (EPA 2013).



Figure 6. Location of Brunswick Harbor ODMDS. Source EPA 2013.

On average, approximately 1.0 - 1.5 million cubic yards of dredged material from the entrance channel is placed at the ODMDS annually. Project sediments typically range from 2 to 72 percent fine-grained material depending on their location along the length of the channel. All placement of material in the ODMDS is done in accordance with section 103 of the MRPSA. Location of the ODMDS is shown in Figure 6.

1.6. Prior Reports and Studies

The following are relevant prior reports completed for Brunswick Harbor:

USACE, Final Environmental Impact Statement, Brunswick Harbor Deepening Project, Brunswick, Georgia, March 1998

This Environmental Impact Statement (EIS) is the decision document for the previous Brunswick Harbor Deepening Project. The EIS described the formulation of alternatives

and selection of the 6-foot deepening plan, which created an authorized depth of -36 feet MLLW in the inner harbor and -38 feet MLLW across the bar channel. The project described in this EIS was constructed between 2004 and 2008, and this authorized depth continues to be maintained. The 1998 EIS documents environmental compliance for the ongoing operations and maintenance dredging activities in Brunswick Federal Channel.

USACE, Letter Report for Small Navigation Projects CAP Section 107, Brunswick Harbor Improvements, July 21, 2011.

This letter report documented problems identified by the Brunswick Harbor Pilots within two areas of Brunswick Harbor. At these locations, pilots expressed concern with navigating the largest RO/RO vessels due to channel width. Preliminary cost estimates identified a project that exceeded construction cost limits of the USACE Continuing Authorities Program (CAP). Therefore, the non-Federal sponsor pursued a specific authorization per WRRDA 2014, Section 7001.

NOAA, 2020 South Atlantic Regional Biological Opinion for Dredging and Material Placement Activities in the Southeast United States (2020 SARBO), July 30, 2020.

Under Section 7 of the Endangered Species Act, federal agencies must consult with National Marine Fisheries Service (NMFS) on activities that may affect Endangered Species Act (ESA) listed species. In compliance with ESA Section 7 consultation requirements, on March 27, 2020 (revised July 30, 2020), NMFS issued the 2020 SARBO. The 2020 SARBO is a Biological Opinion for dredging and material placement activities under the jurisdiction of the United States Army Corps of Engineers Civil Works and Regulatory Programs and dredging/sand mining in borrow sites in federal waters under the jurisdiction of the Bureau of Ocean Energy Management (BOEM) Marine Minerals Program in the Southeast United States from the North Carolina/Virginia Border through and including Key West, Florida and the Islands of Puerto Rico and the U.S. Virgin Islands. Activities considered in the 2020 SARBO include dredging; dredge material placement; geotechnical and geophysical surveys, conducted by the Corps, necessary to complete dredging and material placement projects, and monitoring for and handling of ESA-listed species encountered during projects covered under this Opinion. The 2020 SARBO concluded that the proposed action is not likely to jeopardize the continued existence of ESA listed species or result in adverse effects to designated critical habitats considered in the Opinion. See Section 8, beginning on page 377, and Section 9 at page 427. The Opinion includes an Incidental Take Statement in Section 10 on page 427 with associated Reasonable and Prudent Measures and Terms and Conditions. The 2020 SARBO replaces the 1997 SARBO.

1.7. Proposal for Federal Action

The proposed Federal Action is navigation improvements to the Brunswick Harbor Federal Channel that change the footprint of the current Federal channel. Navigation improvements include a range of channel modifications. Section 3.7 describes the alternative development process and Section 3.8 the alternatives that are analyzed in

detail in this EA. The plan formulation process described in Chapter 3 concluded with the recommendation to implement Alternative 8, which includes widening the Federal channel at three locations and dredging approximately 551,000 cubic yards of material. Dredged material would be disposed of at the Andrews Island Dredged Material Containment Area (DMCA).

1.8. Overview of Integrated Report

This document is an Integrated Feasibility Report/Environmental Assessment (IFR/EA). The purpose of the feasibility report is to identify the plan that reasonably maximizes the National Economic Development (NED) net benefits, is technically feasible, and environmentally sustainable. The purpose of the EA portions of the report is to comply with NEPA requirements to identify and analyze environmental effects of the alternatives, incorporate environmental concerns into the decision-making process, and to determine whether any environmental impacts are significant and warrant the preparation of an Environmental Impact Statement. The six steps of the Corps planning process each align with a NEPA requirement. The planning steps are listed below followed by the document chapter and NEPA element to which they relate:

Planning Step	NEPA Element and Document Chapter
Step 1: Problems and Opportunities	Purpose and Need for Action; Chapter 3
Step 2: Inventory and Forecast of Conditions	Affected Environment (or Existing/Future conditions); Chapter 2
Step 3: Formulate Alternative Plans	Alternatives including Proposed Action; Chapter 3
Step 4: Evaluate Effects of Alternative Plans	Environmental Consequences; Chapter 4
Step 5: Compare Alternative Plans	Alternatives including Proposed Action; Chapters 3 and 4
Step 6: Select Recommended Plan	Agency Preferred Alternative; Chapter 3 and 5

2. Affected Environment

Existing conditions represent conditions at the time of report completion. Future conditions represent forecasted future without project conditions during the period of analysis, which is 50 years. The existing conditions descriptions contained in this section are the most relevant to the evaluation of project alternatives. Section 4.0 contains an analysis of the impacts from the alternatives on the resources described in this Section.

The existing conditions description includes both periodic and routine operations and maintenance (O&M) dredging throughout the 30 miles of Federally authorized channels. Currently, the average annual quantity of O&M material dredged for Brunswick Harbor is approximately 1.6 million cubic yards annually. This amount includes approximately 390,000 cubic yards in the inner harbor reach and 1,219,000 cubic yards in the outer harbor or entrance channel. Inner harbor dredged material is disposed of in the Andrews Island Dredged Material Containment Area (DMCA) and outer harbor dredged material is disposed of in the Brunswick Ocean Dredged Material Disposal Site (ODMDS). O&M dredging, using all dredge types including cutterhead, clamshell, and hopper dredges, will occur annually as needed based on shoaling rates. Environmental compliance for O&M dredging is documented in the 1998 Final Environmental Impact Statement for the Brunswick Harbor Deepening Project. O&M dredging is required to adhere to direction provided in the 2020 SARBO. See Section 2.3.1.2 of the 2020 SARBO.

2.1. Planning Horizon

The planning horizon encompasses the study period, construction period, period of analysis, and project life. The study began on April 11, 2019 and is estimated to be completed by March 11, 2022. Design of the recommended plan is estimated to begin on November 1, 2022 and be completed by October 31, 2023. The construction period is estimated to begin on November 1, 2024 and be completed by October 31, 2025. The period of analysis for this study is 50 years, from 2026 to 2075.

2.2. Navigation and Economic Conditions

Historic and Existing Commerce

The Port of Brunswick is the largest automobile port in the U.S. In fiscal year 2018, over 629,000 combined auto/machinery units moved through the port for import or export (GPA, 2019). This translated into almost 1 million metric tons of vehicles and parts moved. Figure 7 shows the total tonnage by major commodity between 2013 and 2018.

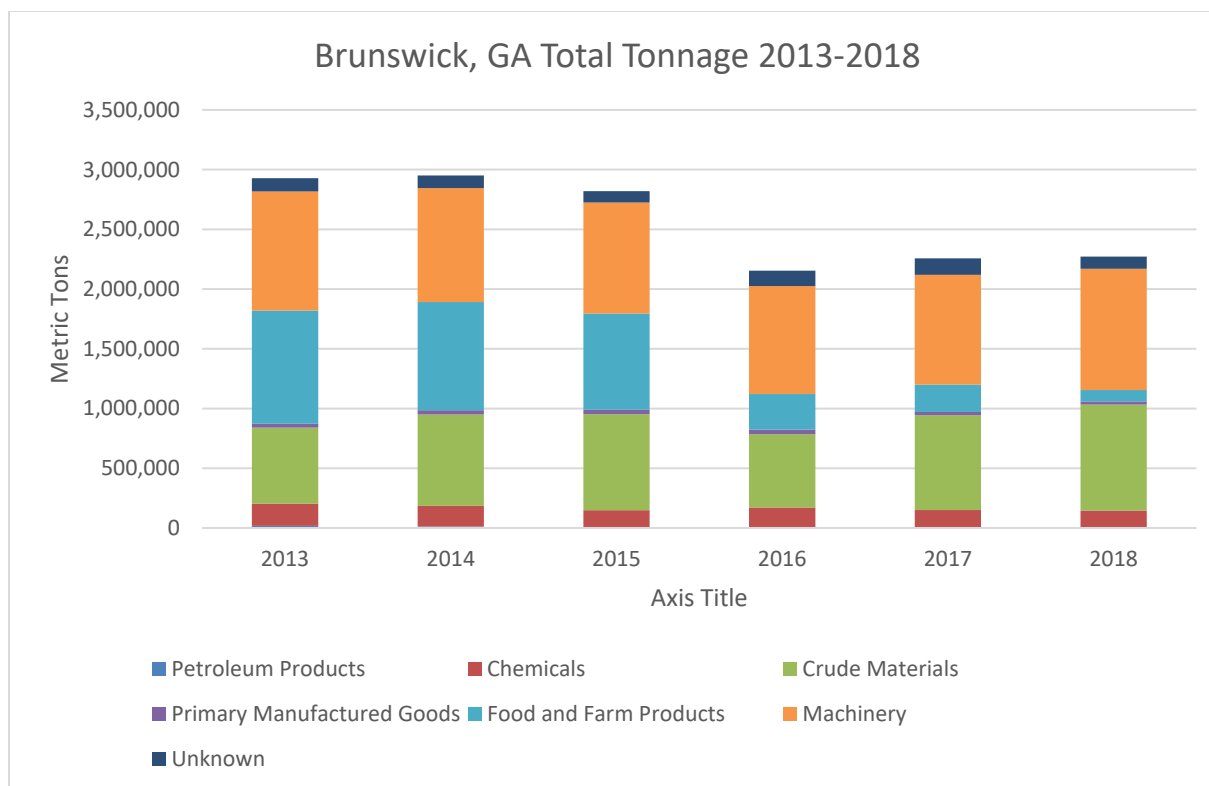


Figure 7. Brunswick Total Tonnage 2013-2018
(Source: Waterborne Commerce Statistics Center, 2019)

Port tonnage has decreased since 2014, mainly due to decreases in bulk grain tonnage through the port. The trades in bulk soybeans and corn have been traditionally very cyclical through Brunswick. Since 2013, the customers moving these goods have experienced issues with weather, vessel crews, railroad scheduling, and prices. These issues led to the gradual decline in bulk agricultural volumes. Therefore, most of the grain now is exported via the Mississippi River. This led to the closure of the grain loading facility at Colonel's Island Terminal after it was damaged by a storm in 2018. This facility was developed into more parking for vehicles and for high and heavy cargo used in RO/RO trades. On average, 2.3 million metric tons have moved annually between 2007 and 2017.

There has been an almost even split of the tonnage between imports and exports. Imports have averaged around 1 million metric tons per year since 2013, and exports have averaged around 1.4 million metric tons per year. As shown in Figure 8, vehicles make up about 60 percent of the total tonnage imported into Brunswick since 2013.

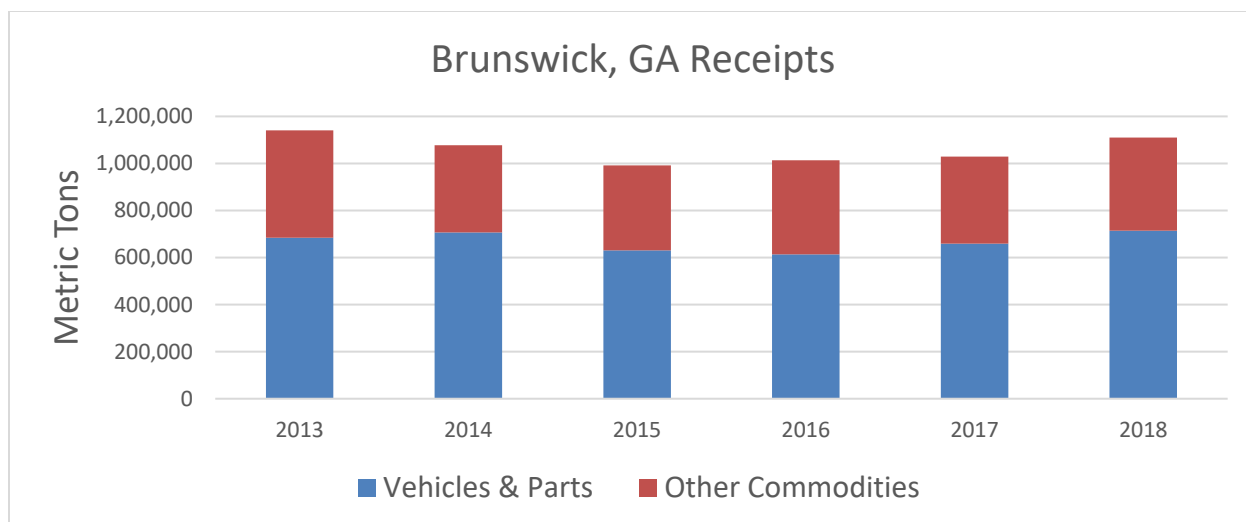


Figure 8. Brunswick, GA Import Tonnage 2013-2018
(Source: Waterborne Commerce Statistics Center, 2019)

Existing Vessel Traffic

The authorized Federal channel in Brunswick Harbor was designed in the 1990s for a RO/RO design vessel with dimensions of 660 feet long and 106 feet wide. Today, longer and wider vessels use the channel. Vessels up to 870 feet long or 134 feet wide have called on the Colonel's Island Terminal to move vehicles. The current fleet of RO/RO vessels are broken up into five different classes.

- **Pure car and truck carriers (PCTC)** are the oldest and most prolific class of RO/RO, having been used at least since 1995. They are approximately 660 feet in length and have a CEU capacity of 6,600. They provide flexible and efficient operations. This class was the previous study's design vessel.
- **Large car and truck carriers (LCTC)** are longer than a PCTC at around 750 feet long. These are a slightly newer class that entered use around 2000. They also have a higher loading ramp and deck capacity, expanding the range of cargo that can be transported. They have a CEU capacity of up to 7,900.
- **The Mk IV/Mk V classes** are heavy RO/RO vessels with extreme ramp and deck capacity—up to 500 tons. These were designed more specifically for the carriage of heavy equipment and breakbulk cargo while retaining significant car capacity (5,500-6,000 CEU). Mk IVs entered use around 2000, while Mk Vs entered around 2010. They can be between 800-870 feet long and 106 feet wide.
- **High Efficiency RO/RO (HERO)** carriers are the newest, most advanced RO/RO vessel, combining elements of all other vessel types. It is between 655-656 feet long and has the capacity of an LCTC (7,600 – 8,000 CEU) and capability similar

to a Mk IV, all in a highly efficient design. Its width is designed for the expanded locks of the Panama Canal and can be 114-134 feet wide. This class entered use in 2015.

Table 1 shows typical vessel characteristics of the five classes of RO/RO vessels that currently utilize the channel. The bottom four rows display how often each of the five classes of RO/RO vessels called on the port from 2015-2018.

Table 1. Brunswick Harbor Vessel Characteristics and Port Calls²

Class	PCTC	LCTC	Mk IV	Mk V	HERO
Length overall	650-671 ft	747-763 ft	789-803 ft	868-870 ft	655-656 ft
Beam	77-107 ft	105-107 ft	105-106 ft	105-107 ft	114-134 ft
2015 calls	393	65	5	1	2
2016 calls	315	69	4	9	35
2017 calls	299	60	1	5	39
2018 calls	325	68	0	0	53

PCTC are still the predominant class used in Brunswick, accounting for an average of 77 percent of RO/RO vessel calls between 2015 and 2018, but the number of HERO vessels is on the rise, accounting for an average of seven percent of RO/RO calls within the same time period and 12 percent in 2018.

Vehicle shippers employ a variety of routes to move goods around the world, and through Brunswick Harbor. Table 2 illustrates a single vessel voyage and shows the list of different ports a vessel may visit before and after their calls to Brunswick Harbor.

² Source: National Navigation Operation & Management Performance Evaluation & Assessment System, 2017

Table 2. Example RO/RO Vessel Route through Brunswick

PORT	DAY	ACTIVITY
Panama Canal	1	Transit
Manzanillo, PAN	2	Discharge & Load
Brunswick, GA	6	Discharge & Load
Savannah, GA	7	Discharge & Load
Newport News, VA	9	Discharge
Baltimore, MD	10	Discharge & Load
Philadelphia, PA	12	Discharge
New York, NY	13	Discharge & Load
Zeebrugge, BEL	23	Discharge
Bremerhaven, GER	25	Discharge & Load
Zeebrugge, BEL	26	Load & Discharge
Southampton, UK	27	Discharge & Load
Bristol, UK	29	Load & Discharge
Savannah, GA	39	Discharge & Load
Manzanillo, PAN	43	Discharge & Load
Panama Canal	44	Transit
Port Hueneme, CA	52	Discharge & Load
Tacoma, WA	56	Discharge & Load
Yokohama, JPN	69	Discharge
Tianjin, CHN	73	Discharge

As a result of this large network of pickups and deliveries, shippers rarely load or unload their full vehicle capacity at Brunswick. While many vessels have capacity for 6,000-8,000 CEUs, the maximum shipment seen in Brunswick Harbor in one time may be 2,000-2,500 CEUs. Offloading crews can move over 200 units an hour from the vessels to the parking areas, leading typical port calls to last between 4-8 hours.

Numerous vehicle services call on Brunswick Harbor which are operated by several carriers and have trade routes which originate in Asia, Europe, or Latin America. See Section 2.3.2 of the Economic Appendix for carriers and trade lanes included in this analysis. The nine services originating in Asia or Oceania which access the U.S. East Coast and Gulf Coast via the Panama Canal were combined into a single route group, “Trans-Pacific” (TP). The route group “Trans-Atlantic” (TA) represents eight different services which call Brunswick and other U.S. East Coast ports. These services connect to Europe, Africa, and the Middle East. The route group “Short Sea” (SS) represents four different services which call on Brunswick and other U.S. ports on either side of the Panama Canal. These services also connect Central and South America to other global ports.

Distances associated with each route group were not used as part of this analysis, since widening alternatives are being evaluated. There are no origin-to-destination benefits, so at-sea savings were not measured. Only efficiencies gained inside the port are measured due to widening alternatives, and no routes were considered.

Harbor Pilot Rules

A Harbor Pilot guides ships through the harbor and are expert ship handlers with extensive knowledge of local waterways. The Brunswick Harbor Pilots have guidelines for vessel operations depending on RO/RO vessel length and draft. Since the channel is 400' wide, traffic is one-way inside the channels. Historically, there were two locations available where vessels could wait for oncoming traffic to pass if needed and if weather conditions allowed. The two locations are at the turning basin near Colonel's Island and in St. Simons Sound near the entrance to Brunswick Harbor. However, both locations are likely not available in the future. At the turning basin, construction of a new berth at Colonel's Island Terminal will limit available space and the maneuver will not be able to be completed. In St. Simons Sound, vessels can only pass if one vessel leaves the Federal Channel. The Harbor Pilot must request and receive U.S. Coast Guard (USCG) permission to leave the Federal Channel. The USCG has expressed that future requests for vessels to leave the Federal Channel will be denied (A. McConnell, personal communication, Nov. 3, 2020)

Large tides and resulting strong currents can cause navigation issues for larger vessels transiting to and from Colonel's Island Terminal. Vessels greater than 768 feet long that are destined for Colonel's Island Terminal will have a tide and current restriction. They can only be inbound at slack water on a high tide. All RO/RO vessels are susceptible to the wind due to their tall sail area. Therefore, any RO/RO vessel heading to or from Colonel's Island Terminal may face delays when sustained winds are greater than 20 knots. While the pilots do not have a hard rule on maximum draft, due to fluctuating maintenance dredging requirements, vessels that exceed 32 feet of draft may experience delays due to waiting on high tide before beginning their transits.

Future Commerce

Using the commodity forecast for receipts and shipments and the average weight per CEU derived from historical CEU volumes provided by the GPA, a CEU forecast was developed. The long-term trade forecasted rates for the Brunswick Harbor study combined data obtained from IHS Global, Inc., USACE waterborne commerce databases, and the GPA. Volumes for the near-term (2019-2020) were held constant, based on industry and global economic dynamics. From 2021-2046, volumes were estimated to grow per the IHS rates. Commodity growth is held constant after 20 years following the base year (2026) due to the uncertainty surrounding such long-term forecasts. However, benefit levels remain constant through the remaining period of analysis as well. More detail on the commodity forecast can be found in Appendix A (Economics). Receipt CEU's are made up of primarily passenger vehicles, while shipment CEU's are primarily high and heavy cargo, like construction equipment; hence, the heavier weight per shipment CEU. Table 3 provides the receipt and shipment CEU forecast, along with the weight per CEU for the three route groups.

Table 3. Brunswick CEU Forecast – Receipt and Shipment

Route Group	Weight per Receipt CEU	2026	2036	2046
TP	1.5	188,331	255,569	336,384
TA	1.5	323,871	387,601	457,356
SS	1.5	29,428	39,934	52,562
Total Receipts		541,629	683,104	846,302
Route Group	Weight per Shipment CEU	2026	2036	2046
TP	2.3	76,563	109,032	149,878
TA	2.3	84,560	98,493	113,022
SS	2.3	13,137	18,893	26,200
Total Shipments		174,261	226,418	289,100

The total number of CEUs, by receipt and shipment, and route group are shown in Table 4. Receipt CEUs are forecasted to grow from 500,000 in 2026 to 850,000 in 2046. Shipment CEUs are forecasted to grow from 170,000 in 2026 to 290,000 in 2046, an increase of 70 percent. The Compound Average Growth Rate (CAGR) for each route represents the geometric average growth of receipts and shipments, which accounts for the effect of compounding over time. For the Trans-Atlantic route, for example, receipts are projected to grow from 324,000 to 457,000 over the 20-year period at a CAGR of 1.7 percent per year.

Table 4. Brunswick Total CEU Forecast by Route for Receipts and Shipments

Total CEUs - Receipts	2026	2036	2046	CAGR
TP	188,331	255,569	336,384	2.9%
TA	323,871	387,601	457,356	1.7%
SS	29,428	39,934	52,562	2.9%
Total	541,629	683,104	846,302	2.2%
Total CEUs - Shipments	2026	2036	2046	CAGR
TP	76,563	109,032	149,878	3.4%
TA	84,560	98,493	113,022	1.5%
SS	13,137	18,893	26,200	3.3%
Total	174,261	226,418	289,100	2.5%
Total Overall CEUs	2026	2036	2046	CAGR
TP	264,894	364,600	486,262	3.0%
TA	408,431	486,094	570,378	1.7%
SS	42,565	58,827	78,762	3.0%
Total	715,890	909,522	1,135,402	2.3%

As seen in Table 4, the forecasted CEU trade is not expected to exceed port capacity of 1.5 million CEUs over the forecast period.

RO/RO Vessels Calling at Port of Brunswick

The study team developed a Brunswick-specific fleet forecast using an internal analysis of Port of Brunswick historical calls and the world RO/RO fleet snapshot in 2017. Table 5 shows the historical calls at Brunswick by class. Note that in 2018, Brunswick received 53 HERO calls, despite there being 15 HERO vessels currently in service. This means that all HERO vessels currently in service called on Brunswick multiple times over the year. The same is true for LCTC's. Examination of the pilot's logs from Brunswick confirm this to be true.

Table 5. Historical Vessel Calls at Port of Brunswick by Class, 2015-2018

Class	PCTC	LCTC	Mk IV	Mk V	HERO
2015 calls	393	65	5	1	2
2016 calls	315	69	4	9	35
2017 calls	299	60	1	5	39
2018 calls	325	68	0	0	53

The study team then used the historical fleet utilization as a baseline for forecasting the future fleet. Table 6 displays the percent cargo share by each vessel class for years 2015 to 2018.

Table 6. Percent Cargo by Vessel Class, 2015-2018

	2015	2016	2017	2018
Receipt				
PCTC	86%	57.5%	58.9%	64%
LCTC	12%	23%	20%	16%
Mk IV	1.8%	0.5%	0.1%	0%
Mk V	0.01%	3%	1%	0%
HERO	0%	16%	20%	20%
Shipment				
PCTC	95%	80%	73.9%	72%
LCTC	5%	13%	13%	12%
Mk IV	0.2%	0%	0%	0%
Mk V	0%	0.9%	0.1%	0%
HERO	0%	6%	13%	16%
Total				
PCTC	90%	63%	64%	66%
LCTC	9%	19%	17%	15%
Mk IV	1%	0.3%	0%	0%
Mk V	0.01%	2.3%	0.6%	0%
HERO	0%	15%	18%	18%

Total cargo movements on Previous Post-Panamax (PPP) (LCTC or larger) RO/RO's grew from 10 percent in 2015 to 33 percent in 2018, a significant trend.

Based on inputs from shippers and car manufacturers, shipping capacity will have stabilized to match reduced vehicle production by around 2023. At that point, shipbuilding is expected to rebound by the base year of 2026, based on the anticipated cycle of automotive production growth. During the last shipbuilding increase from 2012-2015, an average of 20 vehicle carriers were built per year, and 10 were scrapped. Given their higher average age (27 years), it is assumed that PCTC's are retired during this time. Given their emissions and capacity advantages, HERO's are expected to be added to the fleet. These new HERO's will continue the trend of more fuel-efficient design and incorporate new low-emissions technologies such as exhaust gas scrubbers, engines designed for lower-sulfur fuel, or even LNG-powered engines (Automotive Logistics, 2019)

It is assumed that HEROs will continue to be the high end of the spectrum of large PPP vehicle carriers over the forecast period. HEROs are the most fuel efficient and cost-effective option to ship vehicles in the fleet. Shipper feedback has been very positive on the performance of the HERO class over the last 2 years, citing better than expected performance in carrying capacity and fuel economy. Consistent with economic production theory, shipping firms will seek to maximize profits by lowering costs. Therefore, shifting cargo share to HERO vessels is consistent with that rationale. With an additional 10-20 HERO vessels in the world fleet by 2026, HEROs would be poised to take a larger share of the cargo moving at Brunswick. As Table 6 shows, HERO cargo share is about 18 percent already. With this projected fleet shift, a cargo share of 25 percent is likely by 2026, and an ultimate share of 30 percent is likely by the end of the forecast period, 2046, as shown in Table 7 and Figure 9.

Table 7. Historical and Forecasted Cargo Share by Class at Brunswick

	2015	2016	2017	2026	2036	2046
Receipt						
PCTC	86.00%	57.50%	58.90%	58.00%	53.00%	53.00%
LCTC	12.00%	23.00%	20.00%	17.00%	17.00%	17.00%
Mk IV	1.80%	0.50%	0.10%	0.00%	0.00%	0.00%
Mk V	0.01%	3.00%	1.00%	0.00%	0.00%	0.00%
HERO	0.00%	16.00%	20.00%	25.00%	30.00%	30.00%
Shipment						
PCTC	95.00%	80.00%	73.90%	63.00%	58.00%	58.00%
LCTC	5.00%	13.00%	13.00%	12.00%	12.00%	12.00%
Mk IV	0.20%	0.00%	0.00%	0.00%	0.00%	0.00%
Mk V	0.00%	0.90%	0.10%	0.00%	0.00%	0.00%
HERO	0.00%	6.00%	13.00%	25.00%	30.00%	30.00%
Total						
PCTC	90.00%	63.00%	64.00%	60.00%	55.00%	55.00%
LCTC	9.00%	19.00%	17.00%	15.00%	15.00%	15.00%
Mk IV	1.00%	0.30%	0.00%	0.00%	0.00%	0.00%
Mk V	0.01%	2.30%	0.60%	0.00%	0.00%	0.00%
HERO	0.00%	15.00%	18.00%	25.00%	30.00%	30.00%

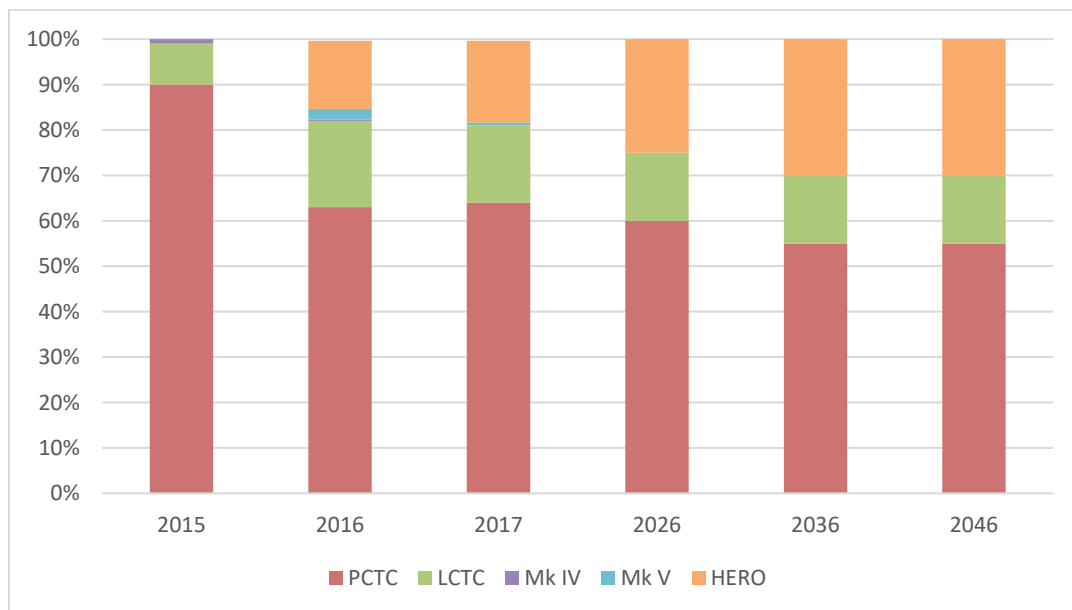


Figure 9. Historical and Forecasted Cargo Share by Class at Brunswick

This increase in cargo share, given today's loading practices, would result in substantial increases in calls from HERO vessels in Brunswick. As mentioned before, all PPP RO/RO vessels (LCTC and HERO) in the world fleet would call on Brunswick multiple

times each year. The projected number of vessel calls through 2019, based on partial year's data from GPA, and the initial forecast of RO/RO vessels through the year 2046 is depicted in Table 8. PPP RO/RO vessels will make up about 50 percent of the vessel calls through 2046. Since pilot restrictions only apply to LCTC and HERO vessels, there would be a larger potential for increased delays in the future without-project condition than in the future with-project condition.

Table 8. Historic and Baseline Vessel Call Forecast for Port of Brunswick by Year
(Source: GPA, 2019)

Vessel Class	2018	2019 (Projected)	2026	2036	2046
PCTC	318	285	301	353	444
LCTC	67	87	78	99	125
HERO	52	60	143	219	277
Total	437	432	522	671	845

2.3. Hydrology and Floodplains

Brunswick Harbor is located on the Turtle, East, and Brunswick Rivers in the Lower Satilla River Basin. The Satilla River Basin is approximately 3,940 square miles of coastal plain composed primarily of the Satilla River, Little Satilla River, and Turtle River. The Satilla River Basin extends from the headwaters in Ben Hill County, Georgia to the Atlantic Ocean in Brunswick, Georgia. Figure 10 shows the location of Brunswick Harbor within the Satilla River Basin.

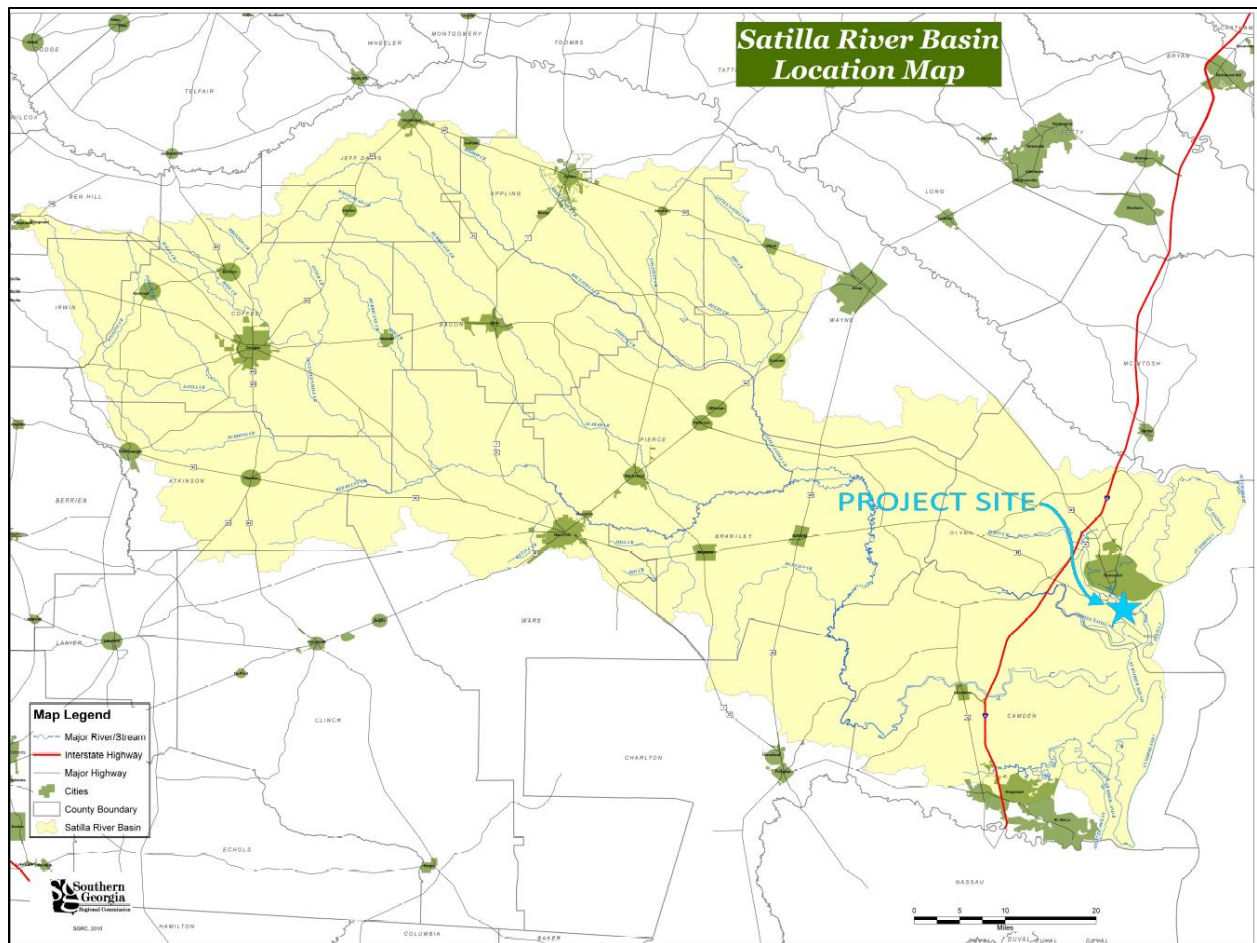


Figure 10. Location of Brunswick Harbor Within Satilla River Watershed
(Source: Satilla Riverkeeper, 2019)

The major drainage in the project vicinity includes the Turtle River and the South Brunswick River, which merge just east of Colonel's Island Terminal and flow through Brunswick Harbor to St. Simons Sound. The East River is oriented in a roughly north/south direction, passing along the east side of Andrews Island before discharging into the Brunswick River just upstream of the Sidney Lanier Bridge (US Highway 17). In addition to these main streams, a complex network of small streams, creeks, and tidal sloughs dissect the entire estuarine complex (*Brunswick EIS, 1998*).

Tides in the study area are semidiurnal (two equally proportioned high and low tides every lunar day). The mean tide range in Brunswick Harbor is approximately 6.5 feet near St. Simons Sound and 7.3 feet in the East River. Maximum ebb velocities usually range from 1.5 to 3.0 feet per second during mean tide conditions.

The USACE regulation for implementing Executive Order (EO) 11988 (ER 1165-2-26) defines the base floodplain as the 100-year or one percent chance floodplain. Extensive floodplain swamps are located throughout the Lower Satilla Basin adjacent to the tidally influenced riverine systems.

Brunswick Harbor's climate is generally pleasant with short mild winters and hot, humid summers. The temperate to subtropical climate of the coastal ocean from North Carolina to Florida is influenced by the location of the Azores high-pressure system. High pressure is located offshore at its southern extent during winter months resulting in contact between polar and tropical air masses. The result is strong winter storms with gusty winds. Rainfall in the Brunswick area is typically 50 inches per year with the highest rainfall normally in August and September. Other precipitation types are rare. Hurricane season generally extends from late May to late October with the coastal region of Georgia ranked as a moderately high-risk zone.

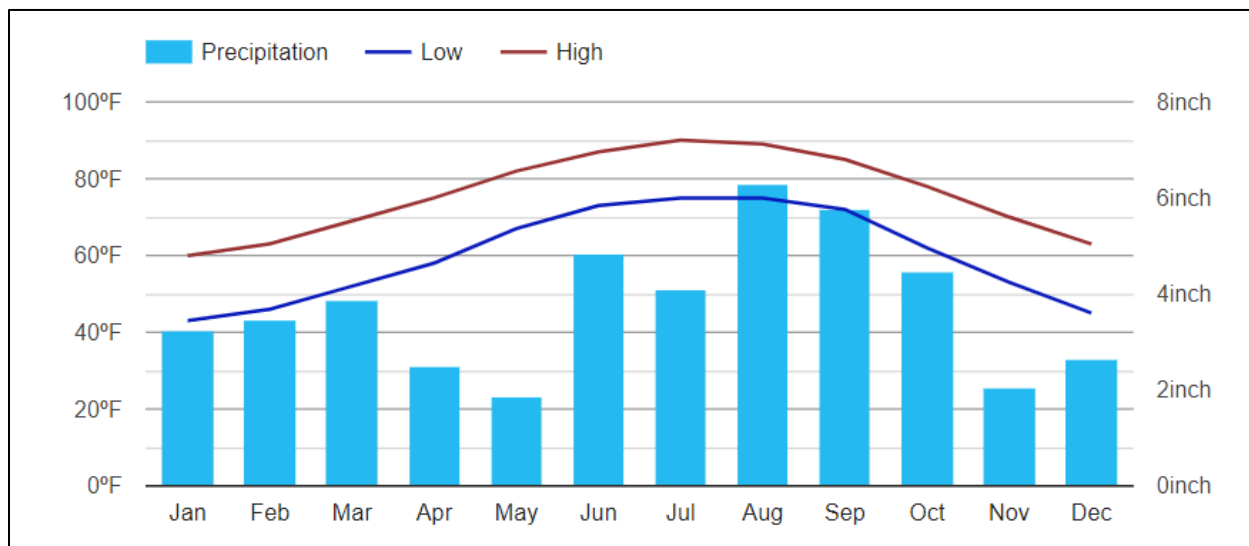


Figure 11. Average Annual Rainfall and Temperatures for Brunswick, GA (US Climate Data, 2020)

2.4. Aquatic Resources, Habitat, and Substrate

The study area within the lower Brunswick River, which includes the inner channels through St. Simons Sound, Brunswick River, South Brunswick River, and Turtle River, supports an abundant and diverse fish and invertebrate community. Habitats within the project site consist of submerged unconsolidated estuarine bottom, intertidal flats, and estuarine emergent marsh. Most of the study area is open water that receives semi-diurnal tidal flushing from St. Simons Sound. As a result, the salinity levels tend to be approximately 25 parts per thousand (ppt), depending on tide stage. The water in the Harbor is well-mixed with a relatively uniform salinity (GPA, 2015).

Common fish species include American shad and striped mullet. Other species found within the study area include diadromous fish (those fish that spend portions of their life cycles partially in fresh water and partially in saltwater) such as striped bass, blueback herring, and shortnose and Atlantic sturgeon. Other important recreational fish include southern kingfish, spot, red drum, black drum, tarpon, and flounder. Sharks also frequent the subtidal and intertidal zones between Brunswick, St. Simons Island, and Jekyll Island. Common shark species include bonnet head, bull shark, Atlantic black tip, sandbar, tiger, nurse, and lemon.

The existing scientific literature on offshore benthic assemblages along the east coast of the U.S. and Gulf of Mexico continental shelf was reviewed by Brooks et al. (2006). Benthic assemblages are an important foraging resource for fish species inhabiting the marine subtidal zone. Polychaetes were most often cited as the principal infaunal taxa present in studies from both the Gulf of Mexico and Atlantic coasts of the U.S. The polychaetes, *Prionospio cristata*, *Nephtys incisa*, *N. picta*, and *Spiophanes bombyx*, were the only dominant taxa found in both the Gulf of Mexico and the east coast of the U.S. (Brooks et al. 2006). Polychaetes of the Family Spionidae are tube-building surface deposit feeders while polychaetes of the Family Nephtyidae are free-living predators consuming mollusks, crustaceans and other polychaetes (Fauchald and Jumars 1979).

Macrobenthic invertebrate species that could be in the study area range from shrimp, crabs, oysters, and clams, to other species such as polychaetes, mollusks, and other less well known species which make up the remainder of the food chain. Open water areas are populated by a variety of species of phytoplankton and zooplankton (USACE, 1998).

Other aquatic species that could be in or nearby the study area include North Atlantic right whale, humpback whale, fin whale, West Indian manatee, loggerhead sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and green sea turtle. These species and their occurrence are described in Section 2.7.

The introduction of non-native or invasive species can have detrimental effects on an ecosystem. As defined by EO13175 (December 8, 2016), an invasive species is a non-native organism whose introduction causes or is likely to cause economic or environmental harm, or harm to human, animal, or plant health. EO 13175 charges the Federal Government with duties to refrain from authorizing, funding, or implementing actions that are likely to cause or promote the introduction, establishment, or spread of invasive species in the U.S. unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions. No invasive plant species have been identified within the existing Federal project footprint.

The Georgia Invasive Species Advisory Committee has identified 101 aquatic nuisance species that currently exist in Georgia or have a high probability of being introduced into Georgia. This list includes 28 plant species, 52 animal species (mollusks, amphibians, and crustaceans) and 21 disease causing organisms (GANSMP). Several invasive species have been documented within the lower Brunswick River area. These include the green mussel (*Perna viridis*) and the Giant tiger prawn (*Penaeus monodon*). The green mussel is a native of the Indo-Pacific region. It is believed the mussel was introduced to Georgia from boats and equipment being transferred between coasts without adequate cleaning of attached organisms and draining of bilge water. The Giant

tiger prawn is a non-native species introduced through accidental release from aquaculture facilities and have been documented from Georgia to Texas.

Macrobenthic invertebrate species are highly dependent on the quality and composition of substrata. The following summaries represent the physical characteristics from which “Macrobenthos” rely on, each serving as estimates of what type of sediment can be expected to be found in the project focus areas (bend widener, turning basin, and the meeting area west of the Sidney Lanier Bridge). See Chapter 3 for a description of the project alternatives and identification of the recommend plan.

The substrata data was referenced from both historical and recent sediment borings, with the initial phase consisting of a historical data review from existing borings, which were collected in 1999 during the previous Brunswick Harbor Deepening, as well as the more recent geotechnical investigations that were conducted in late 2020 to further evaluate material characteristics in the proposed dredging locations. The more recent sediment boring investigations focused on the locations of the proposed new work (turning basin near Colonels Islands Terminal and the bend widener located in Cedar Hammock range near buoy 24). Appendix B contains detailed information about the results of the 2020 geotechnical sampling and additional description of the regional geology and materials characteristics.

Bend Widener:

Sediment near the bend widener generally consists of very loose to medium dense sand, silty sand, clayey sand with shell, weathered limestone, and sandstone fragments down to the boring termination elevations of approximately -51.0 feet MLLW. Based on the historical boring logs and laboratory analysis in this vicinity, the sediment also includes high and low liquid-limit clay, high and low liquid-limit silt, poorly-graded and well-graded sand, silty-clayey sand, poorly-graded gravel, silty gravel, and clayey gravel.

Turning Basin:

Sediment near the turning basin generally consists of very loose to loose sand, silty sand, and clayey sand with shell fragments down to approximate elevations of -24 feet MLLW. These materials are underlain by very loose to medium dense sand, silty sand, clayey sand with shell, weathered limestone, and sandstone fragments to approximately -52 feet MLLW. Based on the historical boring logs and laboratory analysis in this vicinity, the sediment also includes high and low liquid-limit clay, low liquid-limit silt, poorly-graded and well-graded sand, silty clayey sand, and poorly-graded gravel.

Meeting area west of the Sidney Lanier Bridge:

Based on the historical boring logs for this area, the sediment consists of: high and low liquid-limit clay, high and low liquid-limit silt, poorly-graded and well-graded sand, silty sand, clayey sand, silty-clayey sand, poorly-graded gravel, silty gravel, and clayey gravel. Moderately to highly weathered, moderately hard to hard, highly porous limestone was also noted in this reach. As described in Chapter 3, this area was

screened from further analysis therefore no geotechnical samples were collected in this area during the 2020 sampling effort.

2.5. Essential Fish Habitat

Essential fish habitat (EFH) is defined by the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1802(10)) of 1996 as those waters and substrate necessary for fish spawning, breeding, feeding, or growth to maturity. The MSA is the primary law responsible for governing marine fisheries management in U.S. federal waters and aims to promote conservation, reduce bycatch, and rebuild overfished industries. The South Atlantic Fishery Management Council (SAFMC) is responsible for the conservation and management of fish stocks within the Federal 200-mile limit of the Atlantic Ocean off the coasts of North Carolina, South Carolina, Georgia and east Florida. The SAFMC consists of 17 members made up of 13 voting members and four non-voting members which includes the Southeast Regional Administrator of the National Marine Fisheries Service, directors or designees of the four South Atlantic state marine resource management agencies, and eight citizens (two per state) of the southeastern states. Non-voting members include representatives of the U.S. Fish and Wildlife Service, U.S. Coast Guard, State Department, and Atlantic States Marine Fisheries Commission. The SAFMC manages the following species occurring in the Lower Brunswick River area: shrimp (brown, white, and pink), gag grouper, gray snapper, black sea bass, Spanish mackerel, summer flounder, and several shark species.

High priorities for EFH conservation are called Habitat Areas of Particular Concern (HAPC) and merit special attention from the National Oceanic and Atmospheric Administration (NOAA) Fisheries. An EFH is considered a HAPC if it serves major ecological functions, is sensitive to declines, is stressed from development, and is rare habitat. The HAPCs, as currently designated by the SAFMC and NOAA include coastal inlets under the fishery management plans for shrimp complex and the snapper grouper complex. The HAPCs, as currently designated by the SAFMC and NOAA include coastal inlets under the fishery management plans for shrimp complex and the snapper grouper complex. For grouper, the post larval and juvenile stages of this fish will typically be found within the Coastal Inlet EFH while the adult, egg, and larval stage remain out to sea. For shrimp species, the post larval, juvenile, and sub-adult juveniles can be found throughout this EFH while the adult, egg, nauplius, and protozoa stages remain out to sea (Sanger and Parker 2016). The oyster reef and coastal inlets that are located within and adjacent to the study area are considered EFH-HAPC.

Table 9 depicts the EFH occurring in the study area or immediate vicinity. Potential effects from the project are described in Section 4.3. More information on the designation of these habitats can be found in “*Users Guide to Essential Fish Habitat Designations by the South Atlantic Fishery Management Council*” (SAFMC, 2020).

Specifically, the following EFH habitat occurs in each of the proposed impact areas:

- Proposed Bend Widener: Coastal inlets

- Proposed Turning Basin: Unconsolidated bottom and Tidal creeks
- Proposed Channel Widener/St. Simons Meeting Area: Coastal inlets
- Proposed Channel Widener/Meeting Area West of Sidney Lanier Bridge: Unconsolidated bottom and Tidal creeks

Table 9. Essential Fish Habitat

Essential Fish Habitat	Potential Presence	
	In/Near Project Vicinity	Potential Project Effect
Estuarine Emergent Wetlands	Yes	No
Estuarine Scrub/ Shrub Mangroves	No	No
Submerged Aquatic Vegetation	No	No
Oyster Reefs & Shell Banks	Yes	No
Subtidal/Intertidal Non-vegetated Flats	No	No
Palustrine Emergent & Forested Wetlands	No	No
Aquatic Beds	No	No
Unconsolidated Bottom	Yes	Yes
Estuarine Water Column	Yes	Yes
Coastal Inlets	Yes	Yes
Live/Hard Bottoms	No	No
Coral & Coral Reefs	No	No
Artificial/ Manmade Reefs	No	No
Sargassum	No	No
Tidal Creeks	Yes	Yes
Marine Water Column	Yes	Yes
Coastal Inlets	Yes	Yes
Council designated Artificial Reef Special Management Areas	No	No
Hermatypic Coral Habitats & Reefs	No	No
Hoyt Hills	No	No
Sargassum Habitat	No	No
State Designated Areas of Importance of Managed Species	No	No
Submerged Aquatic Vegetation	No	No
Gray's Reef	No	No

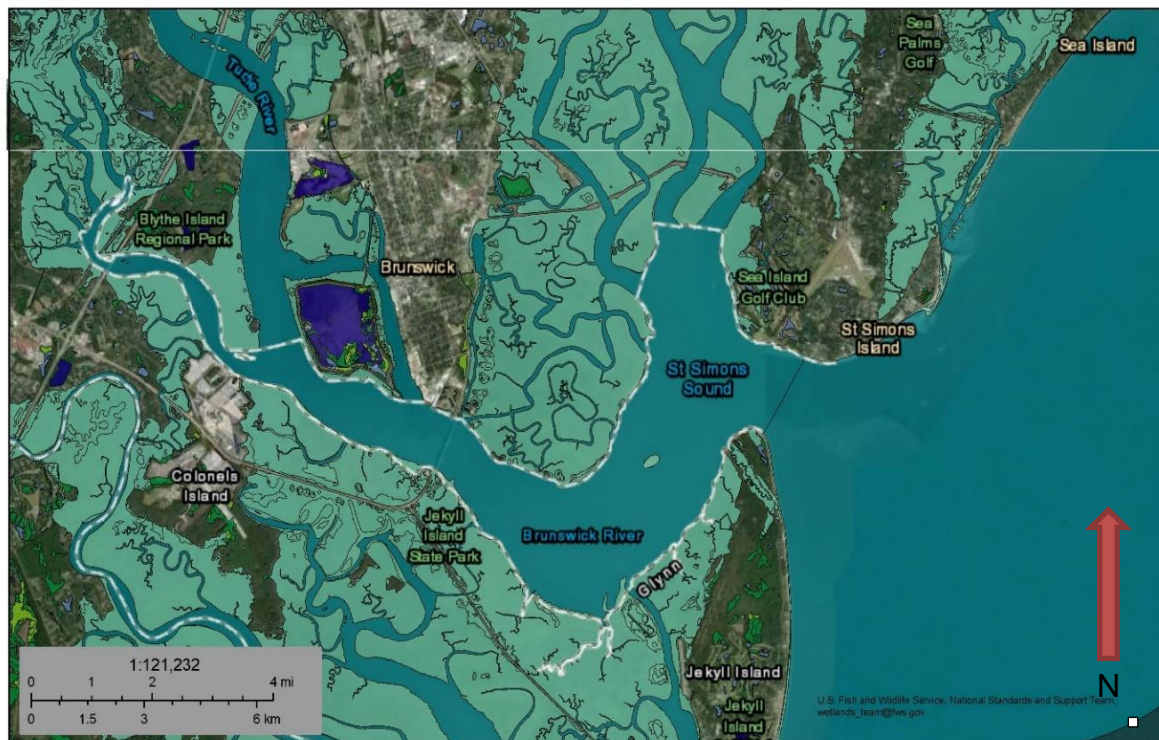
2.6. Wetlands

Brunswick Harbor is located in the lower Atlantic Coastal Plain of Georgia. Extensive expanses of salt marsh and barrier islands separate Glynn County from the Atlantic Ocean. Tidal creeks and inlets separate the barrier islands. The majority of the habitat within the project site consists of submerged unconsolidated estuarine bottom and intertidal flats.

Diverse wetland communities occur throughout Glynn County and include 74,000 acres of saltwater and brackish marsh, 4,700 acres of freshwater marsh, 4,700 acres of tidal swamps, and 29,500 acres of open water (Latham River/Jekyll Creek Environmental Restoration Project EIS, 1999). The lower East River area is industrialized. The eastern shore is nearly entirely developed, primarily with docks serving marine shippers or commercial fisherman. Wetlands are located along a narrow band on the western shoreline, between the river and a dike, which defines a portion of the Andrews Island Dredged Material Confinement Area. The salt marshes in the general area are of varying salinity and are vegetated in the lower elevations by smooth cordgrass (*Spartina alterniflora*). Higher marsh elevations are dominated by less abundant species, such as salt meadow cordgrass, glassworts, black needlerush, salt grass and sea ox-eye. Wetlands located adjacent to East River are primarily smooth cordgrass marshes existing along the river.

Wetland Mapping

A recent National Wetlands Inventory (NWI) Map for the study area confirms the classes of wetland and open water throughout the study area as described above (Figure 12).



February 4, 2020

Wetlands

Estuarine and Marine Deepwater	Freshwater Emergent Wetland	Lake
Estuarine and Marine Wetland	Freshwater Forested/Shrub Wetland	Other
	Freshwater Pond	Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Figure 12. National Wetlands Inventory for Brunswick Harbor
From (<https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/>)

2.7. Protected Species

Regulations for Protected Species

ESA

The Endangered Species Act (ESA) of 1973 (16 USC 1531-1543) regulates activities affecting plants and animals Federally classified as endangered or threatened, as well as the designated critical habitat of such species.

MBTA/ BGEPA

The [Migratory Bird Treaty Act \(MBTA\) of 1918](#) (16 U.S.C. 703-712; Ch. 128; July 3, 1918; 40 Stat. 755) prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service. The Bald and Golden Eagle Protection Act (BGEPA) of 1940 (16 U.S.C. 668-668c) prohibits anyone from "taking" bald eagles, including their parts, nests or eggs without a permit issued by the Secretary of the Interior. Under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, 51 species of birds have been identified under the IPAC that are protected within the study area, including the American bald eagle.

MMPA

The Marine Mammal Protection Act (MMPA) of 1972 established a national policy to prevent marine mammal species and population stocks from declining beyond the point where they ceased to be significant functioning elements of the ecosystems of which they are a part. It must be noted that all marine mammals are protected under the MMPA and some additionally are protected under the ESA. Three federal entities share responsibility for implementing the MMPA:

- **NOAA National Marine Fisheries Service**—responsible for the protection of whales, dolphins, porpoises, seals, and sea lions.
- **U.S. Fish and Wildlife Service**—responsible for the protection of walrus, manatees, sea otters, and polar bears.
- **Marine Mammal Commission**—provides independent, science-based oversight of domestic and international policies and actions of federal agencies addressing human impacts on marine mammals and their ecosystems (NOAA MMPA).

The 2020 U.S. Department of Commerce National Marine Fisheries Service (NMFS) South Atlantic Regional Biological Opinion (2020 SARBO) lists species of concern for the study area, including the open water of the entrance channel.

Table 10 identifies the species that have been listed by the USFWS and the NMFS as occurring or possibly occurring within Glynn County, as well as species that may be listed within the study area or within the proximity to the study area. This section provides a summary of the NMFS species in the study area, with more detail in Section 4 of the 2020 SARBO.

Table 10. Federally Listed species occurring within Glynn County

U.S. Fish and Wildlife Service Jurisdiction		
Common Name	Scientific Name	Status
West Indian manatee	<u><i>Trichechus manatus</i></u>	Threatened
Piping plover*	<u><i>Charadrius melodus</i></u>	Threatened
Red Knot	<u><i>Calidris canutus rufa</i></u>	Threatened
Eastern black rail	<u><i>Laterallus jamaicensis jamaicensis</i></u>	Threatened
Wood stork	<u><i>Mycteria americana</i></u>	Threatened
Eastern Indigo snake	<u><i>Drymarshon corais couperi</i></u>	Threatened
Gopher tortoise	<u><i>Gopherus polyphemus</i></u>	Candidate
Loggerhead sea turtle ⁺	<u><i>Caretta caretta</i></u>	Threatened
Leatherback sea turtle ⁺	<u><i>Dermochelys coriacea</i></u>	Endangered
Green sea turtle ⁺	<u><i>Chelonia mydas</i></u>	Threatened
Altamaha Spiny mussel	<u><i>Elliptio spinosa</i></u>	Endangered
Hairy Rattleweed	<u><i>Baptisia arachnifera</i></u>	Endangered
National Marine Fisheries Service Jurisdiction		
North Atlantic Right whale*	<u><i>Eubalaena glacialis</i></u>	Endangered
Sei whale	<u><i>Balenoptera borealis</i></u>	Endangered
Blue whale	<u><i>Balaenoptera musculus</i></u>	Endangered
Sperm whale	<u><i>Physeter macrocephalus</i></u>	Endangered
Fin whale	<u><i>Balaenoptera physalus</i></u>	Endangered
Kemp's Ridley sea turtle	<u><i>Lepidochelys kempii</i></u>	Endangered
Hawksbill sea turtle	<u><i>Eretmochelys imbricata</i></u>	Endangered
Loggerhead sea turtle ⁺	<u><i>Caretta caretta</i></u>	Threatened
Leatherback sea turtle ⁺	<u><i>Dermochelys coriacea</i></u>	Endangered
Green sea turtle ⁺	<u><i>Chelonia mydas</i></u>	Threatened
Oceanic Whitetip shark	<u><i>Carcharhinus longimanus</i></u>	Threatened
Giant manta ray	<u><i>Manta birostris</i></u>	Threatened
Atlantic Sturgeon	<u><i>Acipenser oxyrinchus oxyrinchus</i></u>	Endangered
Shortnose sturgeon	<u><i>Acipenser brevirostrum</i></u>	Endangered
<p>*Critical Habitat for this species found within Glynn county or adjacent coastal waters.</p> <p>⁺Species under both U.S. Fish and Wildlife and National Marine Fisheries Service Jurisdiction</p> <p>NOTE: List developed by the USFWS, Information for Planning and Consultation (IPaC) Website, June 2019 and the NOAA Fisheries Southeast Region Protected Resources Division, Threatened and Endangered Species Directory for Georgia, Southeast U.S.</p>		

FWCA

The Fish and Wildlife Coordination Act (FWCA) of 1934 (16 USC 661-666c) ensures fish and wildlife resources receive equal consideration to other features of water resource development projects. The FWCA requires Federal agencies involved with such projects to first consult with the USFWS and the respective state fish and wildlife agencies regarding the potential impacts of the project on fish and wildlife resources. Whenever the waters or channel of a body of water are modified by a Federal agency, or by any other entity where a Federal permit is required, adequate consideration must be made for the conservation, maintenance, and management of wildlife resources and habitat. The use of the waters, land, or interests for wildlife conservation must be in accordance with plans approved jointly by: the head of the department or agency exercising primary administration; the Secretary; the head of the state agency exercising administration of the wildlife resources.

Table 11 identifies GA state-listed species as occurring or possibly occurring within Glynn County (GADNR-WRD).

Table 11. Georgia's State Listed Species (Glynn County)

Animal/ Plant	Common Name	Scientific Name	State Status	Habitat	U.S. Listing
Animal	American Oystercatcher	<i>Haematopus palliatus</i>	Rare	Sandy beaches; tidal flats; salt marshes, shell rakes, sand bars	No
Animal	Atlantic Sturgeon	<i>Acipenser oxyrinchus oxyrinchus</i>	Endangered	Open ocean, estuaries; lower end of large rivers in deep pools with soft substrates; spawn as far inland as Macon, GA on the Ocmulgee	Listed Endangered
Animal	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Threatened (GA)	Edges of lakes and large rivers; seacoasts	Bald and Golden Eagle Protection Act/the Migratory Bird Treaty Act
Animal	Black Skimmer	<i>Rynchops niger</i>	Rare	Tidal creeks and tidal ponds; sandy beaches, spits and dredge islands	No
Animal	Diamondback Terrapin	<i>Malaclemys terrapin</i>	Unusal	Entire coast, estuarine and marine edge; All saltmarsh, beaches	No
Animal	Eastern Indigo Snake	<i>Drymarchon couperi</i>	Threatened	Sandhills; pine flatwoods; dry hammocks; summer habitat includes wetlands	Listed Threatened
Animal	Gopher Tortoise	<i>Gopherus polyphemus</i>	Threatened	Sandhills; dry hammocks; longleaf pine-turkey oak woods; old fields	Candidate
Animal	Green Sea Turtle	<i>Chelonia mydas</i>	Threatened	Open ocean; sounds; coastal rivers; beaches	Listed Threatened
Animal	Gull-billed Tern	<i>Gelochelidon nilotica</i>	Threatened	Salt marshes; fields; sandy beaches, interdune, dredge islands	No
Animal	Henslow's Sparrow	<i>Ammodramus henslowii</i>	Rare	Grassy areas, especially wet grasslands, pitcher plant bogs, pine flatwoods, power line corridors in CP. Requires open veg at ground level with grass canopy above	No
Animal	Kemp's Ridley	<i>Lepidochelys kempii</i>	Endangered	Open ocean; sounds; coastal rivers; beaches	Listed Endangered

Animal/ Plant	Common Name	Scientific Name	State Status	Habitat	U.S. Listing
Animal	Least Tern	<i>Sternula antillarum</i>	Rare	Sandy beaches; sandbars, dredge islands	No
Animal	Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	Endangered	Open ocean; sounds; coastal beaches	Listed Endangered
Animal	Loggerhead Sea Turtle	<i>Caretta caretta</i>	Endangered	Open ocean; sounds; coastal rivers; beaches	Listed Threatened
Animal	Northern Atlantic Right Whale	<i>Eubalaena glacialis</i>	Endangered	Inshore and offshore ocean waters	Listed Endangered
Animal	Piping Plover	<i>Charadrius melodus</i>	Threatened	Sandy beaches; tidal flats, inlets	Listed Threatened
Animal	Rafinesque's Big-eared Bat	<i>Corynorhinus rafinesquii</i>	Rare	Pine forests; hardwood forests; caves; abandoned buildings; bridges; bottomland hardwood forests and cypress-gum swamps	No
Animal	Red Knot	<i>Calidris canutus</i>	Threatened	Beaches and exposed mudflats	Listed Threatened
Animal	Shortnose Sturgeon	<i>Acipenser brevirostrum</i>	Endangered	Estuaries; lower end of large rivers in deep pools with soft substrates	Listed Endangered
Animal	Spotted Turtle	<i>Clemmys guttata</i>	Unusual	Heavily vegetated swamps, marshes, bogs, small ponds, and tidally influence freshwater wetlands; nest and possibly hibernate in surrounding uplands	No
Animal	Swallow-tailed Kite	<i>Elanoides forficatus</i>	Rare	River swamps; marshes, open pine and bottomland forest with super canopy pines.	No
Animal	West Indian Manatee	<i>Trichechus manatus</i>	Endangered	Estuaries; tidal rivers, nearshore ocean waters	Listed Threatened
Animal	Wilson's Plover	<i>Charadrius wilsonia</i>	Threatened	Sandy beaches; tidal flats	No
Animal	Wood Stork	<i>Mycteria americana</i>	Endangered	Cypress/gum ponds; impounded wetlands with islands or emergent cypress; marshes; river swamps; bays	Listed Threatened
Plant	Ciliate-leaf Tickseed	<i>Coreopsis integrifolia</i>	Threatened	Floodplain forests, streambanks	No

Animal/ Plant	Common Name	Scientific Name	State Status	Habitat	U.S. Listing
Plant	Climbing Buckthorn	<i>Sageretia minutiflora</i>	Threatened	Calcareous bluff forests; maritime forests over shell mounds	No
Plant	Corkwood	<i>Leitneria floridana</i>	Threatened	Swamps; sawgrass-cabbage palmetto marshes	No
Plant	Florida Wild Privet	<i>Forestiera segregata</i>	Rare	Shell mounds on barrier islands in scrub or maritime forests	No
Plant	Greenfly Orchid	<i>Epidendrum magnoliae</i>	Unusual	Epiphytic on limbs of evergreen hardwoods; also in crevices of Altamaha Grit outcrops	No
Plant	Hooded Pitcherplant	<i>Sarracenia minor</i> var. <i>minor</i>	Unusual	Wet savannas, pitcherplant bogs	No
Plant	Pond Spice	<i>Litsea aestivalis</i>	Rare	Cypress ponds; swamp margins	No
Plant	Rosemary	<i>Ceratiola ericoides</i>	Threatened	Ohoopee Dunes; deep sandridges	No
Plant	Soapberry	<i>Sapindus marginatus</i>	Rare	Coastal shell mounds	No

Federally-Listed Species Occurrence

West Indian manatee

The West Indian manatee (manatee) was originally listed as an endangered species throughout its range in 1967 (32 FR 4061) and received Federal protection with the passage of the ESA in 1973. The manatee was reclassified from endangered to threatened on May 5, 2017. Between October and April, manatees appear to concentrate in areas of warmer water. During the remainder of the year, manatees appear to choose areas with an adequate food supply and water depth, often in close proximity to a source of fresh water. Manatees primarily consume submergent, emergent, and floating vegetation.

Manatees are found in Georgia mainly during warmer months of the year. Records in Georgia are primarily random sightings and carcass finds and are not the result of systematic research. The Georgia population is primarily migratory in nature and therefore fluctuates with season. Manatees are most frequently sighted in Georgia waters from April through October in the waters of Camden, Glynn, and McIntosh counties.

North Atlantic right whale

North Atlantic right whales typically inhabit coastal waters along coastal Georgia each winter, often close to shore. According to the NOAA species directory website, each fall, some right whales travel more than 1,000 miles from North Atlantic feeding grounds to the shallow, coastal waters of South Carolina, Georgia, and northeastern Florida. These waters in the southern U.S. are the only known calving area for the species. These whales migrate to the winter calving areas each winter and remain near the surface with their new calves making them susceptible to vessel strikes. The migration to and from calving areas follows a typical pattern, but can vary. This offshore location, considered critical habitat for calving, is between the federal navigation channel and the offshore placement area (ODMDS). NARW are found along the coast and within the action area for the entrance channel, ODMDS and transiting areas

This endangered species is of particular concern to NMFS due to its critically low population numbers, low calving rates including no calves born in 2018, and an unusual mortality event where 49 individuals of an estimated population of 400 died within a few years. This approximately 10% loss of population is a significant setback to the recovery of the population especially since there was also a decrease in calves during a similar timeframe (<https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2021-north-atlantic-right-whale-unusual-mortality-event>).

Blue, fin, sei, and sperm whales

Blue, fin, sei, and sperm whales typically reside offshore in deep waters and are not anticipated to be present in the study area. The blue, fin, and sei whales are also not discussed in detail in this assessment as they are unlikely to be within the vicinity of the St. Simons Sound or the ODMDS as they are typically offshore species, residing in deep water.

Wood stork

The wood stork is a large, bald-headed wading bird that stands more than 3 feet tall, has a 5-foot wing spread, and weighs 4 to 6 pounds. It is the only stork species that breeds in the U.S. The species eats primarily fish, foraging in a variety of open, shallow freshwater and estuarine wetlands. Preferred habitat includes areas with falling water levels where fish and other prey are likely to be more concentrated in pools. The wood stork is a highly colonial species usually nesting in large rookeries and feeding in flocks. After breeding, wood storks in Georgia generally disperse away from the nesting colonies. Wood Storks may be found throughout the Southeastern U.S. where suitable foraging freshwater and estuarine wetland habitat are located (Georgia EDGES 2019).

Piping plover

The piping plover is a small, stocky shorebird that resembles a sandpiper. The piping plover was listed by the USFWS as threatened and endangered on December 11, 1985. The Great Lakes population is listed as endangered, whereas the Atlantic Coast and Great Plains populations are listed as threatened. Preferred habitats for the species are sandy beaches along the ocean and inland lakes, bare areas in dredge disposal sites, and natural alluvial islands in rivers. Shorelines with little vegetation are preferred for both nesting and feeding. These plovers feed primarily on fly larvae, beetles, crustaceans, mollusks, and other invertebrates that they pluck from the sand (Bent, 1929). Breeding grounds along the Atlantic Coast range from Newfoundland to North Carolina. Wintering areas on the Atlantic Coast are from North Carolina southward through Florida and in the Bahamas and West Indies. Designated critical habitats are located on the south ends of Jekyll Island and St. Simons Island.

Red knot

The red knot is a migratory shorebird endemic to North America. In the Western Hemisphere the red knot breeds in the mid to high arctic tundra of Alaska, Canada, and Greenland. Most breeding habitats are near coastal areas, often on islands. Nest sites are generally on dry, sunny, and slightly elevated areas of tundra, frequently on open gravel ridges or slopes. During migration this species switches to coastal beaches usually at or near the mouth of bays, estuaries, or tidal inlets. Staging sites are associated with high wave-energy coastal areas. Wintering sites are generally intertidal habitats such as beaches with significant wave action or currents. Red knots can be found on any Georgia barrier beach within the winter spring events. Red knots have been seen on Little Tybee, Wassaw, St. Catherines, Blackbeard, Sapelo, Little St. Simons, and Cumberland Islands, as well as St. Catherines Island Bar most often during those timeframes, while Wolf Island, Little Egg Island Bar, and Little St. Simons Island at the mouth of the Altamaha River support the only known late summer and fall staging site on the east coast of the U.S., attracting as many as 12,000 knots at one time (BATES USACE 2019).

Eastern black rail

The Eastern black rail is a small, secretive marsh bird with slate gray plumage and red eyes. The Eastern black rail typically occupies emergent wetlands with "overhead

cover”, with little to no view of bare ground and require wetlands with minimal water coverage during the breeding season. Although the existing marsh area adjacent to the project area is considered part of their historical range, no Eastern black rails have been identified on the Georgia coast during the 2017 and 2018 Eastern black rail surveys conducted in cooperation with USFWS.

Green, Kemp’s ridley, hawksbill, leatherback, and loggerhead sea turtles

Green, Kemp’s ridley, hawksbill, leatherback, and loggerhead sea turtles may be found in the study area. Sea turtle nesting in Georgia is primarily by loggerhead sea turtles occurring from late May to mid-August with infrequent nesting by green, Kemp’s ridley, and leatherback sea turtles. Hawksbill turtles do not nest in Georgia and are rarely found in Georgia coastal waters. Sea turtle nesting data for the study area is available at www.seaturtle.org.

Loggerhead. Loggerhead turtles are a focus for conservation efforts in the study area due to their relative abundance and are a focus of GADNR-CRD conservation efforts. This threatened species was divided into nine Distinct Population Segments (DPS) in 2011 with all loggerhead sea turtles in the United States along the Atlantic Coast and Gulf of Mexico in the Northwest Atlantic DPS (76 FR 58868, Publication Date September 22, 2011). While the loggerhead sea turtle Recovery Plan identified smaller nesting populations based on genetics, it classified loggerhead sea turtles in the study area as part of the Northern Recovery Unit spanning from the Florida /Georgia border north through southern Virginia. Female loggerhead sea turtles regularly nest along the beaches of St. Simons Island and Jekyll Island from April/May through August. The 2019 sea turtle nesting data indicated that for St. Simons Island, there were six loggerhead nests and for Jekyll Island, there were 199 loggerhead nests (GADNR-CRD Sea Turtle Conservation Program).

Adult loggerheads are common in and around the ship channel from Cedar Hammock Range to the ocean. Juvenile loggerheads, greens, and Kemp’s ridley are common throughout the estuary year-round, but are more abundant March through November. The abundance of juveniles is several orders of magnitude higher than adults. Very few adult greens or Kemps are found in Georgia.

Atlantic, shortnose sturgeon

Atlantic sturgeon inhabits coastal, estuarine, and riverine environments on the Atlantic coast. Five separate DPSs of Atlantic sturgeon were listed in 2012 with the study area located within the South Atlantic DPS (77 FR 5880 and 5914, Publication Date February 6, 2012). Atlantic sturgeon commonly occur in the study area. Adults migrate into spawning rivers, designated as critical habitat, in the spring and likely fall. In the study area, adults are typically observed traveling during the spawning season from August to December and juvenile/sub-adults are observed year-round. For the shortnose sturgeon, sub-adult to adult stages may be observed from late winter to early spring (Post- SCDNR).

Shortnose sturgeon, unlike Atlantic sturgeon, tend to spend relatively little time in the ocean, according to the NOAA species directory website. When they do enter marine waters, they generally stay close to shore. In the spring, adults move far upstream and away from saltwater to spawn. While sturgeons are known to occur within the study area, there is no designated critical habitat.

Oceanic white tip shark

The oceanic white tip shark is a deep water, open ocean species that would not be expected to occur within the study area.

Giant manta ray

The giant manta ray inhabits coastal and offshore waters and is frequently observed in nearshore coastal waters and feeding at inlets along the east coast of Florida (see Section 4 of the 2020 SARBO). This species migrates up the coast in warmer months and is expected to occur within the study area.

Although Eastern indigo snake, gopher tortoise, Altamaha spiny mussel and hairy rattlesnake are noted under the USFWS listed species list for Glynn county, none of these species are expected to be found within the study area.

2.8. Air Quality

The Clean Air Act (CAA), as amended, requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The CAA established two types of national ambient air quality standards- primary and secondary. Primary standards are levels established by the EPA to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards are levels established to protect the public welfare, including protection from decreased visibility and damage to animals, crops, vegetation, and buildings.

The EPA has set six NAAQS that regulate six pollutants: carbon monoxide (CO), lead (Pb), nitrogen oxide (NO_x), ozone (O₃), sulfur dioxide (SO₂), and particulate matter (PM_{2.5} and PM₁₀). Geographic areas have been officially designated by EPA as being in attainment or non-attainment for air quality based on an area's compliance with the NAAQS. Glynn County, Georgia is currently in attainment for the NAAQS for all criteria pollutants (EPA Nonattainment Areas for Criteria Pollutants (Green Book, 2021)). Therefore, the study area is under no Federal or State restrictions for the purpose of improving air quality to meet any air quality standards.

2.9. Water Quality

The State of Georgia assesses its water bodies for compliance with water quality standards established for their designated uses as required by the Federal Clean Water Act (CWA). Water quality standards are found in Georgia's Rules and Regulations for Water Quality Control (Chapter 391-3-6-.03). All waters in Georgia are classified into

categories which have different standards depending on the designated use of the water body. These uses include: (a) Drinking Water Supplies; (b) Recreation; (c) Fishing, Propagation of Fish, Shellfish, Game and Other Aquatic Life; (d) Wild River; (e) Scenic River; and (f) Coastal Fishing. Recreation designation is assigned if the water supports general recreational activities such as water skiing, boating, or swimming. The littoral waters on the ocean side of Jekyll and St. Simons Islands are classified as Recreational. All waters within the Brunswick Harbor have the water use classification of Fishing.

Assessed water bodies are placed into one of three categories, supporting designated use, not supporting designated use or assessment pending, depending on water quality assessment results. These water bodies are found on Georgia's 2020 305(b) list. The subset of the water bodies that do not meet designated uses on the 305(b) list are also assigned to Georgia's 303(d) list. Although the 305(b) and 303(d) lists are two distinct requirements under the CWA, Georgia reports both lists in one combined format called the Integrated 305(b)/303(d) List

The 2020 Integrated 305(b)/303(d) list identifies the following sounds and harbors within the study area:

- St. Simons Sound: Assessment pending for the designated use of fishing (Category 3). A Total Maximum Daily Load (TMDL) evaluation for dissolved oxygen (DO) was completed in 2001 and revised in 2019. Arsenic has been found in the tissue of some fish collected from this waterbody. It is currently unknown what fraction of the arsenic in fish tissue is in the more toxic inorganic form. In order to be conservative and protective of human health, fish consumption guidelines have been issued for this water body. However, until a study has been completed to determine what fraction of the arsenic is in the inorganic form, the water will remain in Category 3 (insufficient data or other information to make a determination as to whether or not the designated use(s) is being supported) for 305b/303d purposes.

The 2020 Integrated 305(b)/303(d) list identifies the following coastal streams within the study area:

- East River (Academy Creek to the Brunswick River): Assessed as Category 1 (water quality data that indicate the designated use(s) are being met). Supports the designated use of fishing.
- Turtle River System (Brunswick: Turtle River, Buffalo River, and South Brunswick River): Not supporting the designated use of fishing. Assessed as Category 4a (TMDL developed to address pollutants in violation of water quality standards) for DO, and polychlorinated biphenyl (PCB) contamination in fish tissue. Shell fishing is banned within the water body.

- South Brunswick River (South Brunswick River to the St. Simons Sound): Not supporting the designated use of fishing. Assessed as Category 5 (required to have a TMDL evaluation for the water quality constituent(s) in violation of the water quality standard). The cause is identified as selenium and arsenic contamination in fish tissue, and the source as non-point source and urban run-off. GADNR-EPD needs to determine the "natural DO" for the area before it can be determined whether the dissolved oxygen criteria are being met.

Georgia's Rules and Regulations for Water Quality Control, Rule 391-3-6-.03(5)(d) states that all waters shall be free from turbidity which results in a substantial visual contrast in a water body due to a man-made activity.

Turbidity levels at the study area are influenced by the East River and Turtle River to the west, the Brunswick River to the southwest and St. Simons Sound, and by waves and tidal action. The two reported major sources of turbidity in coastal areas are very fine organic particulate matter and sand-sized sediments that are re-suspended around the seabed by local waves and currents (Dompe and Haynes 1993). Higher turbidity levels are typically expected around inlet areas, and particularly in estuarine areas, due to high nutrient and entrained sediment levels. Although some colloidal materials remain suspended in the water column upon disturbance, high turbidity episodes usually return to background conditions within several days to several weeks, depending on the duration of the disturbance (storm event, dredging, etc. or other) and on the volume of suspended fines.

2.10. Cultural Resources

The management of cultural resources is regulated under Federal laws such as the National Historic Preservation Act (NHPA) of 1966, the Archaeological and Historic Preservation Act of 1974, the American Indian Religious Freedom Act of 1978, the Archeological Resource Protection Act of 1979, NEPA, the Native American Graves Protection and Repatriation Act of 1990, the Abandoned Shipwreck Act of 1987, and the Sunken Military Craft Act of 2004.

Cultural resources considered in this study are those defined by the NHPA as properties listed, or eligible for listing, on the National Register of Historic Places (NRHP) and are referred to as historic properties. Historic properties include buildings, structures, sites, districts, objects, cultural items, Indian sacred sites, archaeological artifact collections, and archaeological resources (36 CFR 800.16(l)(1)). Cultural resources also include resources with unknown NRHP eligibility status.

Archaeological and Historic Setting

The archival research presented here is taken from an earlier Panamerican Consultants, Inc., investigation of the same area (Tuttle and James 1999) and from a report prepared by LG2 Environmental Services, Inc., and Tidewater Atlantic Research in 2017 for survey work conducted of portions of the Little Satilla River in Camden

County, Georgia (Watts et al. 2017). The previous archival research was conducted in several Brunswick area repositories, such as the Museum of Coastal History and the Coastal Georgia Historical Society, both on St. Simons Island, and the collections at the Brunswick Glynn County Library. Records examined included Annual Chief of Engineers Reports of the U.S. Army Corps of Engineers, and previous archaeological studies of the Brunswick Harbor area and of other harbors of similar context were also reviewed and synthesized as part of this research. The archival research identified numerous vessel losses in and around Brunswick. These data enabled the researcher to determine the types of resources lost within the project area, allowing a more accurate interpretation of any that might be encountered. Furthermore, past surveys of the Brunswick Harbor Federal Channel are described in the *Final Environmental Impact Statement, Brunswick Harbor Deepening Project, Brunswick, Georgia, March 1998*.

Prehistoric cultural resources in the Georgia range from PaleoIndian Period (10,000 – 8,000 BCE) through the Archaic Period (8000 – 1000 BCE), Woodland Period (1000 BCE – 1000 CE), and Mississippian Period 1000 – 1500 CE. The Paleoindian period is usually associated with the earliest securely documented period of human occupation in the New World. In Georgia, the Paleoindian period is typically divided into three broad temporal stages (early, middle, late) based on the occurrence of specific point types. During the Archaic Period, new settlement and subsistence patterns emerged, and regional technological innovations were developed. Overall, the Archaic Period was the longest period of prehistoric cultural development in Georgia, with major cultural differences separating the early subperiod from the late. Most research in Georgia has centered on the central Savannah River Valley, where much has been learned, especially regarding the Late Archaic. In general, the Woodland Period is characterized by a greater emphasis on horticulture, sedentism, and the manufacture and use of pottery. In Georgia, distinct changes in ceramic technology differentiate Woodland Period assemblages from those associated with Late Archaic occupations. The Mississippian Period in Georgia is characterized by the emergence of chiefdom-level societies in the southeastern United States that occurred approximately eleven hundred years ago.

The town of Brunswick was established on 383 acres in 1771. Brunswick's population growth greatly increased following the Civil War and when numerous railroads connected the city with other interior regions of the state as well as Florida. Port facilities were built up, and in 1876 the U.S. Army Engineers proposed the construction of a jetty to aid in maintaining the port, which was completed by 1883 (U.S. Army 1876, 1883). Also at this time, the U.S. Army Engineers sponsored dredging to establish and maintain a channel at 15 feet (U.S. Army 1880).

Inventory of Resources in the Study Area

A review of Georgia's Natural, Archaeological, and Historic Resources Geographic Information System (GNAHRGIS) database shows that investigations within the Federal navigation project are limited to the existing channel, associated features, and Bird Island, and that there are no recorded historic properties in the Area of Potential Effects (APE). The APE is defined as the areas that will be widened, including the sideslopes of

the channel (300-foot buffer), within the Federal Navigation Project. The APE also includes areas for dredged material disposal. Staging areas and access roads for construction would also be within the APE. A GNAHRGIS query showed that there are several cultural resources recorded within a 1 km radius of the study area. While no prehistoric sites are known within the proposed project area, several have been found outside the Area of Potential Effects and are described in Table 12. These site types are indicative of the resources that may be found within the APE during terrestrial and remote sensing surveys.

Table 12. Cultural Resources recorded outside the Area of Potential Effects

Site Type	NRHP Status	Comments	In APE?
Mound and village	Unknown	excavated by Holder 1937/38	No
Prehistoric	Unknown		
Early Woodland - Historic Contact/ Historic occupation 1810-1850	Eligible	mitigated	No
Shell Midden/Late Archaic/Mississippian	Unknown		No
Oyster Middens	Unknown		No
Shell Scatter w/intact subsurface midden	Unknown	Additional testing recommended	No
Shell Scatter w/intact subsurface midden	Unknown	Additional testing recommended	No
late 18th-20th Century	Unknown	Razed	No
18th century British fort	Eligible		No
Archaeological site	Unknown		No
J.A. Jones Construction Company Brunswick Shipyard	Eligible District	Historic Resources Report prepared due to future development near district	No

Surveys of the existing navigation channel conducted prior to 1997 resulted in the identification of anomalies in the channel, wideners, and bends that were attributed to modern debris and no further investigations of the anomalies were recommended. A survey of the South River turning basin (existing turning basin) conducted in 1997

located two anomalies that had signatures indicative of submerged cultural resources. These were recommended for diver investigation, but no further work was conducted.

In 2002, Gordon Watts located 17 anomalies in the area where the Bird Island was created. Diver investigations determined that none of the identified anomalies in the area of the Bird Island were significant cultural resources. A detailed discussion and inventory of previous investigations in the federal channel and vicinity is found in the enclosure (Brunswick Harbor Modifications Study Glynn County, Georgia, Section 106 Determination of Effects) that was sent to the Georgia State Historic Preservation Officer and the Tribal Historic Preservation Officers initiating Section 106 that is included in Appendix H.

Potential for Unidentified Cultural Resources

The potential for encountering sunken watercraft in the APE during remote sensing surveys is high due to the use of the area by European inhabitants for over two hundred years. Research conducted for previous surveys of the channel and in the vicinity has compiled lists documenting the losses of vessels in the Brunswick area that date back to the colonial era. Garrison (1980) notes that 40 vessels were lost in the Brunswick area. The majority of losses are in the East River Channel, Disposal Area K, and the Brunswick River Channel. Garrison notes that there should be archaeological surveys conducted in the regions of St. Simons and Jekyll Islands if future construction is planned.

An Espy, Huston & Associates, Inc. (1991) report contains the names of 32 vessels with their dates of loss along with 12 unidentified vessels. A majority of the unidentified vessels are considered to have been lost during the struggles of Empire between Great Britain and Spain. Nine of the 12 unidentified vessels date to the Battle of Bloody Marsh in 1742.

As seen in Table 13, Panamerican Consultants created a list of potential wreck sites when they conducted a survey that included the turning basin in the East River (James 2008). The list was derived from the personal research conducted by Judy Wood, former Savannah District archaeologist (Wood n.d.), Garrison and Evans (1980), the NOAA charts, and an 1888 navigation chart. Tidewater Atlantic Research (TAR 1992) lists 35 named vessels, two unnamed vessels, and a less definite number of vessels from the Battle of Bloody Marsh era.

Table 13. Potential shipwreck sites within the APE.

Name	Type	Date Lost	Comments
<i>Annie</i>	schooner	1906	15 tons, stranded
<i>Dixie</i>	gas screw	8/21/1918	built 1906, burned
<i>Dorothy</i>	side-wheeler	12/15/1915	built 1891, 74 tons, foundered
<i>Dragoon</i>	gas screw	9/30/1907	none

<i>Green Ocean</i>	diesel screw	12/1/1961	built 1938, fishing vessel, foundered
<i>Joseph W</i>	gas screw	9/20/1948	built 1918, fishing vessel, foundered
<i>Lelia E. Rowley</i>	sloop	1/1/1907	none
<i>MaryH.</i>	schooner	9/23/1913	built 1909, 21 tons, foundered
<i>Massosit</i>	gas screw	8/25/1919	fishing vessel, burned
<i>May Garner</i>	steam screw	7/10/1921	built 1893, 101 tons, burned
<i>7Messenger</i>	gas screw	11/11/1910	built 1909, 13 tons, burned
<i>Pope Catlin</i>	side-wheeler	8/28/1899	built 1853, burned and removed
<i>R.LMabey</i>	side-wheeler	2/3/1897	built 1854, 82 tons, burned
<i>Redwing</i>	steamer	10/3/1908	19 tons, burned
<i>Roamer</i>	gas-yawl	12/1/1930	built 1902, burned
<i>Samuel Winpenny</i>	steamer	4/3/1889	none
<i>Tee Cee 0</i>	diesel screw	3/23/1975	built 1956, fishing vessel, burned
<i>Unknown</i>	dredge	8/27/1881	none

Field surveys for the identification and evaluation of cultural resources for the Selected Plan will be conducted during the Preconstruction, Engineering, and Design (PED) phase of this project, if the plan is approved and funded. Due to the lack of detailed project designs during the current feasibility stage, it will not be possible to conduct fieldwork to identify and evaluate cultural resources or to determine the effects of the selected plan on historic properties. Pursuant to 54 U.S.C. 306108 and 36 CFR§ 800.4(b)(2), the Corps is deferring final identification and evaluation of historic properties until PED. A Programmatic Agreement (PA) between the Corps and the Georgia Historic Preservation Division (GA HPD) was executed on October 14, 2020 for this project (Appendix H). This agreement includes Phase I investigations to identify archaeological sites and shipwrecks in areas previously not surveyed where dredging will occur, including a buffer for mooring and anchoring and side-slopes. Any resources found during the surveys will be evaluated for inclusion on the NRHP.

2.11. Recreation

Recreational boaters access the ocean via the Brunswick River and St. Simons Sound from upriver marinas. Most of the waterway is accessible to recreational boaters therefore they can access the ocean without impeding the navigation channel. Boats also use the Atlantic Intracoastal Waterway (AIWW), which crosses St. Simons Sound and the Brunswick River. Also, the Mayor's Point terminal in downtown Brunswick hosts a small cruise ship line that docks monthly during the summer. Coastal Georgia is also an important tourist area, with visitors coming to enjoy the beaches and coastal resources, including enjoyment of marine life, such as sea turtles and dolphins.

2.12. Aesthetics

The lower part of the basin within the study area is characterized by a meandering course with several joining tributaries and confluences. The natural beauty of the Lower Brunswick River has been preserved by a number of factors. Among these are: (1) the preserved *Spartina* saltmarshes are generally intact, (they have not been exploited extensively per the Coastal Marshlands Protection Act (CMPA) of 1970); (2) the major uses of the area, that of recreation (hunting, fishing, and boating), have had little permanent effect on the natural environment; and (3) commerce via the Brunswick River area is largely confined to designated areas to avoid impacts to adjacent marsh and land areas.

Currently, the study area consists of estuarine open water habitat abutted by estuarine emergent marsh and is located adjacent to the Colonel's Island Terminal as well as the City of Brunswick.

There are no parks, national or historical monuments, national seashores, wilderness areas, research sites, or preserves within the project site or in the immediate vicinity of the study area.

2.13. Environmental Justice

EJSCREEN is an environmental justice mapping and screening tool developed by the EPA to that provides demographic and environmental information for a given area. Glynn County is considered the geographic area of interest for this project and was the input to the EJSCREEN tool. Figure 13 displays the results for Glynn County in terms of six demographic indicators and a demographic index. The demographic indicators shown on the graph are: Low-income (the percent of an area's population in households where the household income is less than or equal to twice the federal poverty level), minority population (the percent of individuals in an area who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino), less than high school education (percent of people age 25 or older in an area whose education is short of a high school diploma), linguistic isolation (percent of people in households in which all members age 14 years and over speak a non-English language and also speak English less than "very well"), individuals under age 5, and individuals over age 64.

As shown in Figure 13, Glynn County's minority population is at the 43rd percentile in the state, meaning that the region's percentage of minority population is equal to or higher than 43 percent of the state. When compared with the U.S., the County is at the 56th percentile. The county is in the 56th percentile in the state in terms of low income population (65th in the national percentile); it is in the 65th percentile in the state in terms of linguistically isolated population (57th in the national percentile); it is in the 52nd percentile in terms of population with less than a high school education (59th in the national percentile); 51st in population under the age of five (53rd in the national percentile); and 81st in population over age 64 (71st in the national percentile). The

demographic index, which is based on the average of two demographic indicators: percent low-income and percent minority, shows that county is in the 49th percentile when compared to the state and 60th percentile in the nation.

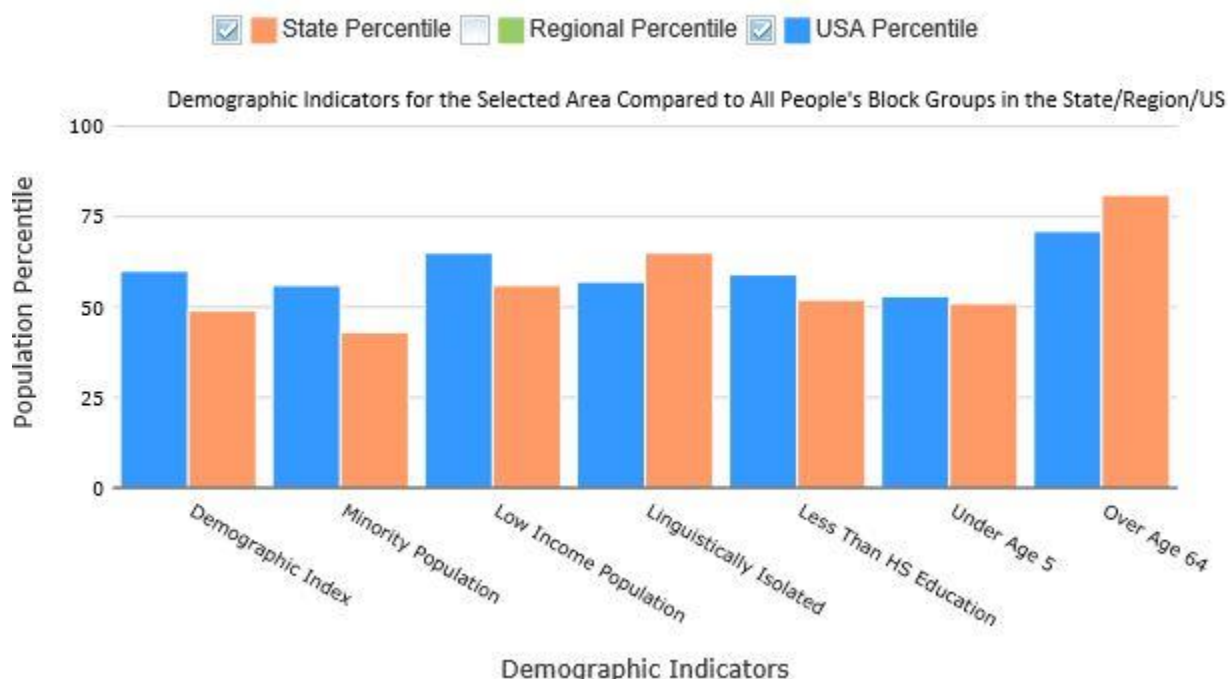


Figure 13. Environmental Justice Demographic Indicators for Glynn County

2.14. Noise

For purposes of regulation, noise is measured in A-weighted decibels (dBA). This unit uses a logarithmic scale to weigh sound frequencies. Table 14 shows typical noise levels and corresponding impressions. Ambient noise levels in Glynn County are quiet to moderate and are typical of recreational environments. The major noise producers on the Lower Brunswick River include recreational boating/maritime activities, beach goers, adjacent commercial and residential areas, boat and nearby vehicular traffic. The study area within the Lower Brunswick River is not densely populated or heavily industrialized, though watershed noises associated with minor industrial, maritime activities from large vessels, and airport activities are the predominant sources of noise in the study area. Naturally occurring noises (bird calls, etc.) are also common within the study area.

Table 14. Typical Noise Levels and Impressions

Typical Noise Levels and Impressions		
Source	Decibel Level	Subjective Impression
Normal breathing	10	Threshold of hearing
Soft whisper	30	---
Library	40	Quiet
Normal conversation	60	---

Television audio	70	Moderately loud
Ringing telephone	80	---
Snowmobile	100	Very loud
Shouting in ear	110	---
Thunder	120	Pain threshold

2.15. Hazardous, Toxic, and Radioactive Waste (HTRW)

Spills

The Corps requested data on spills that could have impacted channel sediments in the vicinity of Brunswick Harbor from the USCG Marine Information for Safety and Law Enforcement System (MISLE) System. That database records information on spills determined to be significant in nature or 100 gallons or more. MISLE is used to schedule and record operational activities such as vessel boardings, marine casualty investigations, and law enforcement and pollution response actions. MISLE is only available to authorized USCG personnel via the USCG intranet but information may be requested by other federal and state agencies. Table 15 lists incidents since the last reported spills in the 2016 Tier III Sediment Evaluation (report submitted to EPA August 2016, concurrence on findings received September 2016). The last entry, Golden Ray MV, is described in detail in the next section.

Table 15. Spills in the Vicinity of Brunswick Harbor

Incident Date	Source	Location	Discharge Type	Discharge Amount (gallons)	Response
02 Oct. 2017	Storage Tank	Terry Creek	Sodium Hypochlorite (diluted)	430	A vacuum truck collected spilled product and soil was remediated
27 Nov. 2018	Fishing Vessel	Brunswick River	Diesel	50	Contractor contained and removed product
09 Jan. 2019	Fishing Vessel	Darien River	Diesel	100	Discharge collected and removed
08 Sep. 2019	Golden Ray MV (RO/RO vessel)	St. Simons Sound	Oil and Diesel	Unknown	Discharge collection, containment, and removal ongoing

The USCG reported that all appropriate safety procedures were followed after each spill (deployment of containment booms and skimmers, recovery of fuel/oil from leaking containers, monitoring of sheens on waterways, etc.). Since these contaminants tend to remain on the water's surface, no significant impacts to channel sediments are expected to have occurred from these incidents.

U.S. Coast Guard National Response Center Database:

A USCG National Response Center (<http://nrc.uscg.mil>) query for incidents in Brunswick Harbor was conducted. This query revealed approximately 13 incidents that were reported to the National Response Center since the 2016 Tier III sediment testing event

(not including the Golden Ray incident which is described in the next paragraph). Of these, only one incident involved a release over 100 gallons. This event occurred in 2018 and involved a release of ~500 gallons of sewage into the Altamaha Canal. The release was contained. The others were 10 gallons or less. The incident summaries indicate that the primary chemicals that were released consisted mostly of diesel fuel, hydraulic oil, and lubricating oils. Since these contaminants tend to remain on the water's surface, and due to the distance, the events occurred from the project area, no significant impacts to the proposed dredged sediments are expected to have occurred.

The Golden Ray

At approximately 1:45 am local time on September 8, 2019, the MV Golden Ray listed to port and ran aground while transiting St. Simons Sound outbound from Brunswick, Georgia. The vessel remains grounded on the south side of the sound between St. Simons Island and Jekyll Island (Figure 14). The Golden Ray's approximate location is 31° 07.68 N, 081° 24.23 W at the entrance to St. Simons Sound and near the Federal navigation channel. The vessel's current heading is 146.9°, and she has 100.16° heel to port, with 0.36° trim by the stern (Siri Marine, 2020).

An Emergency Order Concurrence was issued from the State of Georgia from November 1, 2019 through December 31, 2020, to allow entities and organizations working under the direction of or on behalf of the Saint Simons Sound Incident Unified Command to participate in all salvage, operations, restoration, and monitoring activities associated with the Saint Simons Sound Incident. On February 4, 2020, the Corps issued both a 408 (impacts to a Federal project) and CWA 404/10 (Nationwide Permit 22) permit to remove the wrecked MV Golden Ray.

The ongoing clean-up efforts to capture and remove fuel, oil, and any other pollutants is independent of this study and is anticipated to be completed prior to the commencement of project construction. No adverse impacts to the sediments in the study area are expected.



Figure 14. Location of MV Golden Ray (St. Simons Sound, Brunswick Harbor)

Cleanup Sites

U.S. Environmental Protection Agency EnviroFacts Database: Several queries were made on the EPA EnviroFacts database (EnviroFacts). A search of the Cleanups in My Community (CIMC) database found 44 sites listed in Glynn County.

The CIMC database lists sites that have the following characteristics: “*Accidents, spills, leaks, and past improper disposal and handling of hazardous materials and wastes ... that have contaminated our land, water (groundwater and surface water), and air (indoor and outdoor). These contaminated sites can threaten human health as well as the environment*”. Of the 44 sites in Glynn County, 32 were Brownfields Sites and five had links to responses. All the incidents were prior to 2016 or past and/or ongoing investigations of 6 superfund sites. There were no new releases listed since the 2016 Tier III testing that could have adversely impacted Brunswick Harbor channel sediments.

A search of the Toxics Release Inventory (TRI) database found 8 sites in the general vicinity of Brunswick Harbor. The TRI database lists sites that have the following characteristics: *“The Toxics Release Inventory (TRI) contains information about more than 650 toxic chemicals that are being used, manufactured, treated, transported, or released into the environment. Manufacturers of these chemicals are required to report the locations and quantities of chemicals stored on-site to state and local governments. EPA compiles this data in an on-line, publicly accessible national computerized database ... which tabulate air emissions, surface water discharges, releases to land, underground injections, and transfers to off-site locations.”* None of the sites listed in this database were considered to have significant adverse effects to Brunswick Harbor or the navigation channel.

Other Databases

The National Institute of Health’s TOXMAP database (<http://toxmap-classic.nlm.nih.gov/toxmap/home/welcome.do>) was searched and no new sites or releases were identified beyond those contained in EPA’s EnviroFacts database.

Results of Previous Sediment Testing

Sediment analyses was conducted for the 1998 Brunswick Harbor Deepening Environmental Impact Statement. Although sediment testing indicated varied results both above and below federal limits per the CWA, the results above federal limits appeared to be localized and although present within Brunswick Harbor, were found in the East River.

Brunswick Harbor entrance channel Operations and Maintenance (O&M) sediments were tested for suitability for ocean disposal in 2016. The testing results reviewed for this evaluation are contained in the August 2016 *MPRSA Section 103 Sediment Evaluation for Brunswick Harbor Navigation Project, Brunswick, GA., ANAMAR Environmental Consulting, Inc.* This work was performed in accordance with the EPA /USACE joint publication, *Evaluation of Dredged Material Proposed for Ocean Disposal - (Testing Manual)*, dated February 1991, referred to as the 1991 “Green Book” and the *Southeast Regional Implementation Manual (SERIM)*, dated August 2008. A portion of this testing included Cedar Hammock Range which is located inside the inner harbor and most represents sediment suitability for surrounding inner harbor O&M sediments. Sediment Chemistry for metals, total organic carbon (TOC), total solids, ammonia, organotins, pesticides, polycyclic aromatic hydrocarbons (PAH) and polychlorinated biphenyls (PCB) varied, but sediments in the Cedar Hammock Range, as well as those in the entrance channel were found suitable for ocean disposal.

A summary of the results from the 1997 and 2016 sediment testing events were shared with the resource agencies and can be found in Appendix L.

No significant changes have been made in Brunswick Harbor since the last major sediment evaluation that would impact channel sediments. No new berths or terminals have been added. The majority of changes in the harbor have been minor to moderate improvements to existing docks, infrastructure, and parking facilities.

2020 BHMS Project Sediment Testing

To better ascertain the site-specific characteristics of sediments to be dredged, and as a condition of the project's GADNR-EPD October 2020 401 Water Quality Certification, sediment samples were collected from the turning basin and bend widener in early November 2020. Sediment, surface water, and elutriate samples were analyzed for metals, pesticides, PCBs, PAHs, and dioxins and furans along with grain size and other physical parameters. In general, analyte concentrations were similar to those identified during the 1997 new work testing and earlier O&M inner harbor and entrance channel sediment testing in 1992, 1993, and 1995 and do not show significant levels of contaminants of concern. The sediment results report can be found in Appendix L.

2.16. Climate Change

The main climate change assessment is the potential of impacts from future Sea Level Change (SLC). The SLC in Brunswick Harbor is forecasted to be a Sea Level Rise (SLR). Inland hydrology is not expected to affect Brunswick Harbor because it is the outlet of the drainage area. The assessment of the watershed vulnerability assessment did not categorize any navigation lines in Hydrologic Unit 0307 (Altamaha–St. Marys Subregion) as vulnerable. There is strong agreement from the literature review that temperatures in the Southeast will increase over the next century. Projections for precipitation events and hydrology are less certain than temperature projections for the Southeast Region.

Sea levels around Brunswick Harbor are expected to rise, depending on the projected rates of rise for low, intermediate, and high scenarios. The estimated relative SLC from 2026 to 2125 was calculated with the USACE SLC Curve Calculator at two NOAA tide gauges: Fernandina Beach, Florida, located 30 miles south of Brunswick Harbor and Fort Pulaski, Georgia located 60 miles to the north of Brunswick Harbor. The SLR projections for the three scenarios for both tide gauges are shown below in feet NAVD88 for the 100-year adaptation horizon.

Table 16. Sea Level Rise projections in feet NAVD88 for low, intermediate, and high scenarios at the end of the 50-year period of analysis (2075) and the 100-year adaptation horizon (2125).

USACE SLC Curve Calculator Scenario	Year 2075		Year 2125	
	Fernandina Beach, FL (NOAA Gauge 8720030)	Fort Pulaski, GA (NOAA Gauge 8670870)	Fernandina Beach, FL (NOAA Gauge 8720030)	Fort Pulaski, GA (NOAA Gauge 8670870)
Low	0.06	0.68	0.41	1.22
Intermediate	0.67	1.29	1.98	2.80
High	2.61	3.23	6.97	7.78

Figure 15 below shows the NOAA SLR viewer. The NOAA SLR viewer was used to preliminarily understand what the effects of SLR would look like at the port and the disposal area. Figure 21 shows inundated areas in blue, with dark blue being deeper and lighter blue being shallower. Areas in green are low-lying areas. Based on this preliminary analysis, the disposal area remains unflooded at the low, intermediate, and high SLC projections. The Port appears to see inundation at a SLR around 3 feet, or the intermediate projected curve at the end of the 100-year adaptation horizon (2125) or the high projected curve at the end of the 50-year planning horizon (2075).

The mean higher high water (MHHW; epoch 1983-2001) plus 3 feet of SLR, represents year 2125 on the intermediate USACE curve at the Fort Pulaski, GA tide gauge. This 3 feet takes into account the MHHW change between 1992 to the start of construction year 2025, which is approximately 0.23 feet, and the change in water level from year 2026 to 2125, approximately 2.80 feet on the intermediate USACE curve at the Fort Pulaski tide gauge.

The existing dock heights at the existing GPA terminals are 14.5 feet MLW (GPA, 2020), which is approximately 18.8 feet NAVD88. The tidal range of Brunswick Harbor is approximately 7.6 feet (GPA, 2020). The estimated SLR for the 50-year period of economic analysis ranges between 0.06 feet NAVD88 and 3.23 feet NAVD88 between the years of 2026 and 2075 (up to an additional 0.53 feet of SLR could occur between the 1992 epoch to the 2025 year of construction). It is unlikely that SLR will affect the dock operations within the 50-year economic period of analysis. Preliminary qualitative analysis indicates that there could be flooding on the north and south ends of Colonel's Island within the 50-year period of analysis, which may require modification within Colonel's Island terminal. Further analysis with higher resolution elevation data and SLR models would be needed to develop further conclusions on flooding due to SLR.

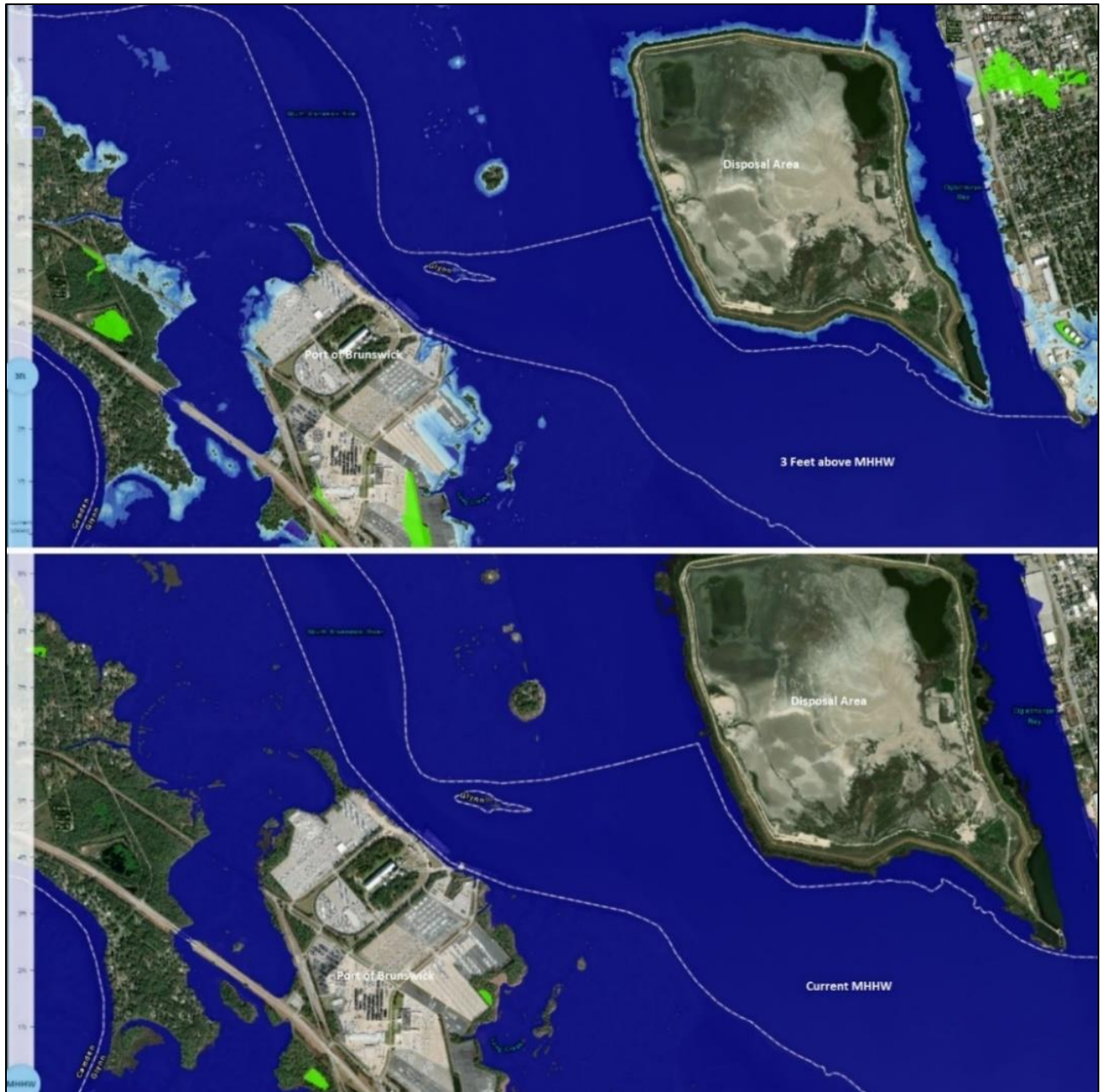


Figure 15. SLR Viewer of Brunswick Harbor and Andrews Island Disposal Area (NOAA, 2020). Top: Future MHHW Conditions with +3 feet of SLR represents year 2125 for the USACE intermediate curve at the Fort Pulaski, GA NOAA tide gauge. Bottom: Existing MHHW Conditions (epoch 1983-2001).

Modifications as part of normal O&M will need to be assessed as sea levels rise. As part of normal maintenance of disposal areas, erosion and toe protection would be evaluated as needed. It is expected that more tidal alerts would occur with SLR.

The air draft under the Sidney Lanier Bridge will need to be assessed with rising sea levels. Currently there is 185 feet of clearance at MHW. Currently the tallest vessels are

around 150 feet. In addition, the tidal range of the Brunswick Harbor is larger than 3 feet, therefore with the addition of 3 feet of SLR, the vessels could choose to sail at a lower tide level.

3. Formulation of Alternative Plans

The guidance for conducting civil works planning studies, Engineer Regulation (ER) 1105-2-100, Planning Guidance Notebook, requires the systematic formulation of alternative plans that contribute to the Federal objective. To ensure sound decisions are made with respect to development of alternatives, and with respect to plan selection, the plan formulation process requires a systematic and repeatable approach. This chapter presents the results of the plan formulation process.

3.1. Problems and Opportunities

Newer RO/RO vessels have increased in length and width since the last design of the Brunswick Harbor Federal Navigation Project. Several locations within the Federal channel present maneuverability challenges and restrictions to large RO/RO vessels. Two areas in particular, the Cedar Hammock Range bend widener, and the turning basin at Colonel's Island Terminal are most problematic. Furthermore, Brunswick Harbor is limited to one-way RO/RO traffic.

Self-imposed transportation safety restrictions are in place such as waiting for suitable weather, favorable tides, and using tugboat assistance earlier in the berthing process. Larger RO/RO vessels are experiencing transportation cost inefficiencies due to these restrictions at targeted areas within the existing Federal channel. As PPP, LCTC, and HERO vessels call more frequently over the 50-year period of analysis, there would be an increase in the number of calls delayed.

Opportunities include:

- Increase maneuverability for large vessels within the Federal channel
- Provide beneficial use of dredged material

3.2. Purpose and Need

The purpose of the proposed action is to reduce transportation cost inefficiencies experienced by the largest RO/RO ship type calling on Brunswick Harbor. Modifications to the Federal channel are needed for the largest RO/RO vessels because of navigation and maneuverability issues due to channel width.

3.3. Objectives and Constraints

The primary objective is to improve the efficiency of the Brunswick Harbor deep-draft navigation system and contribute to National Economic Development by reducing the transportation cost of existing and anticipated future cargo volumes to and from Brunswick Harbor in an environmentally acceptable and sustainable manner during the 50-year period of analysis, from 2026 to 2075.

Planning constraints include avoiding impacts to the existing bridge alignment and clearance of the Sidney Lanier Bridge (vertical clearance of 185 feet Mean High Water) during the 50-year period of analysis, from 2026-2075.

3.4. Management Measures and Screening

Management measures are features or activities that can be implemented at a specific geographic location to address one or more planning objectives and avoid constraints. A preliminary list of structural and non-structural management measures and how they apply to Brunswick Harbor is included below:

Structural Measures

- Channel deepening – Increasing the authorized depth in a Federal channel.
- Channel widening – Increasing the width of the authorized Federal channel.
- Turning basins – Provides for radical change of vessel direction. Usually located at or near the upper end of the interior channel and possibly at one or more intermediate points.
- Anchorages – Provides a location for a vessel to stand by, load, or unload.
- Breakwaters and Jetties – Breakwaters and jetties provide obstruction to littoral drift, control entrance currents, prevent or reduce shoaling in the entrance channel, maintain channel alignment, and/or provide protection from wind and waves.

Non-structural Measures

- Use of tide – Delaying vessel movement until favorable tide conditions.
- Light-loading – Purposely not filling a vessel to capacity (from its point of origin) to accommodate depth conditions at the destination.
- Lightering – The loading or unloading of a vessel by means of lighter or barge. Sometimes used to permit the vessel to proceed in a light-loaded condition through a channel of limited depth. Typically, lightering occurs once a ship is close to its destination.
- Traffic management – Consists of traffic regulations such as speed limits, traffic separation schemes, vessel traffic systems, and other guidelines or restrictions.
- Tug assists – Provides towing services during the vessel berthing process.

Screening

Screening is the process of eliminating, based on planning criteria, those measures that will not to be carried forward for further analysis. Criteria are derived for the specific planning study based on the planning objectives and constraints of the study and study area. Criteria used to screen measures as well as qualitative metrics associated with each criterion include the following:

- Is the measure already being carried out by a non-federal entity? (Yes/No); measure is screened out from further analysis if response is “Yes”.
- Does the measure meet the primary planning objective? “Improve the efficiency of the Brunswick Harbor deep-draft navigation system.” (Yes/No); measure is screened out from further analysis if response is “No”.
- Can the measure be designed to avoid or minimize the impacts outlined in the planning constraints? (Yes/No); measure is screened out from further analysis if response is “No”.

Based on site-specific conditions, is the measure applicable to the project site as a navigation improvement measure? (Yes/No); measure is screened out from further analysis if response is “No”.

Table 17. Measures Screened Out from Further Analysis and Cause for Screening

Measures Screened Out from Further Analysis					
Measures	Already carried out by non-Federal entity?	Meets primary planning objective?	Avoid planning constraints?	Applicable to project site?	Carried forward to alternative development?
Structural					
Channel Deepening	No	No	Yes	Yes	No
Channel Widening	No	Yes	Yes	Yes	Yes
Turning Basin	No	Yes	Yes	Yes	Yes
Anchorage	No	No	Yes	No	No
Breakwaters	No	No	Yes	No	No
Jetties	No	No	Yes	No	No
Non-Structural					
Use of tide	Yes	Yes	Yes	No	No
Light loading	No	No	Yes	No	No
Lightering	No	No	Yes	No	No
Traffic Management	Yes	Yes	Yes	No	No
Tug assists	Yes	Yes	Yes	No	No

Based on the screening summarized above in Table 17, use of tide, traffic management, and tug assists were screened out from further analysis because they are already carried out by a non-Federal entity and would not achieve significant transportation cost savings to meet the primary planning objective. This is because they are already accounted for in the existing condition. Channel deepening, light-loading, lightering, anchorages, breakwaters, and jetties were screened out from further analysis since they would not meet the primary planning objectives to reduce transportation inefficiencies. This is because transportation inefficiencies currently occur due to the increased width and length of RO/RO vessels. Authorized channel depth is not a problem for the current fleet therefore deepening would not be warranted. There are numerous locations for RO/RO vessels to anchor in and around the harbor so additional

anchorage would not be beneficial. RO/RO vessels face greater delays due to ocean and harbor currents and not wave action. Breakwaters and jetties are beneficial to reduce wave action but would not address issues with harbor currents and would not address the planning objectives.

Therefore, the following management measures were carried forward for additional analysis:

- Channel widening
- Turning basin expansion

All the management measures carried forward for additional analysis meet the primary planning objective of the study, are likely to reduce transportation inefficiencies, avoid planning constraints, are not being implemented by a non-Federal entity and are applicable to the project site. The channel widening and turning basin expansion management measures carried forward can be designed to avoid or minimize impacts outlined in the planning constraints.

3.5. Formulation Assumptions

Alternatives are a set of one or more management measures functioning together to address one or more planning objectives. Through the use of harbor pilot information coupled with Savannah District engineering and operations professional judgment, an initial array of alternative plans was formulated. Several assumptions were made in the development of the initial alternatives and are described in the section below.

Design Vessel Assumptions

Design vessel identification assists with informing design parameters for alternatives. For deep-draft navigation projects, the design vessel was selected based on economic studies of the types and sizes of the vessel fleet expected to use the proposed channel over the project life. The design vessel is typically the maximum or near maximum size ship in the forecasted fleet. The current Federal channel was deepened in the 1990s for a RO/RO design vessel with dimensions of 660 feet long and 106 feet wide. Since then, RO/ROs have increased in length or width. There are five distinct classes of RO/RO vessels that use Brunswick Harbor. The classes are grouped by ship length and ship width.

The economics and coastal hydraulics teams recommended a HERO vehicle carrier as the design vessel. This vessel class entered into use in 2015. The typical HERO is about 660 feet long and ranges from 114 to 134 feet wide. They are the widest ships to call on Brunswick Harbor and have an average capacity of approximately 7,600 to 8,000 CEU. These vessels have increased in use at Brunswick Harbor and the call frequency for Colonel's Island Terminal is expected to increase during the period of analysis (see Appendix A for more information). The HERO class is the primary design vessel for the Brunswick Harbor Modifications Study.

Channel Width Assumptions

Proposed channel widths for each alternative were determined based on existing bathymetry, expert elicitation from Harbor Pilots, feasibility-level ship simulation, and in conjunction with guidance from Engineer Manual (EM) 1110-2-1613 (Hydraulic Design of Deep-Draft Navigation Projects). Channel widths range from approximately 100 feet (additional turning basin width) to 1,200 feet (meeting area in St. Simons Sound) within the alternatives.

Local Facility Assumptions

Local facilities include terminals, docks, berthing areas, and local access routes. In recent years, port improvements occurred at the Colonel's Island Terminal. Specifically, 610 acres have been developed for vehicle processing and a further 478 remain permitted for future development. Per GPA, 26 dockside acres have been redeveloped for RO/RO use. GPA completed permitting for a fourth RO/RO berth (termed "Berth 0") in 2019 and Berth 2 is undergoing upgrades to accommodate larger post-Panamax vessels. Other recent upgrades include increasing automobile parking spots from 60,000 to 90,000 units, road improvements, and funding received for future rail expansion design. Local facilities are assumed to be adequate for any Federal channel improvements that may occur.

Beneficial Use of Dredged Material Assumptions

The PDT considered beneficial use of dredged material for all alternatives and worked with stakeholders to identify sites that would meet the Federal Standard for dredged material placement and/or provide the opportunity for beneficial use of dredged material. The Federal Standard for dredged material placement is defined in Corps regulations as the least costly dredged material placement alternative identified that is consistent with sound engineering practices and meets all federal environmental requirements.

If beneficial use is selected for dredged material placement and that beneficial use happens to be (or be part of) the Federal Standard or base plan option for the project (because it is the least costly alternative that is consistent with sound engineering practices and meets all federal environmental requirements), the costs of that beneficial use are assigned to the navigational purposes of the project and are shared with the Non-Federal sponsor according to the navigation project depth.

Beneficial use project costs exceeding the of the Federal Standard (or "base plan") option become either a shared Federal and Non-Federal responsibility, or entirely a Non-Federal responsibility, depending on the type of beneficial use.

3.6. Initial Array of Alternatives

Channel widening and turning basin expansion were carried forward from the screening of measures and formulated into an initial array of alternatives. The PDT considered input from the May 2019 Planning Charette and factored in assumptions related to design, channel width, local facilities and beneficial use of dredged material as described in the previous section. The BHMS Project Delivery Team (PDT) first

developed alternatives focused on two distinct problem locations within Brunswick Harbor where Harbor Pilots had reported maneuverability issues with large RO/ROs. The first location was in the vicinity of USCG Buoy 24 at the intersection of the Cedar Hammock Range and the Brunswick Point Cut Range, known as Widener 13. The second problem area was the width of the South Brunswick River turning basin near Colonel's Island Terminal. In 2011, the Corps prepared a CAP Section 107 Letter Report that first identified these two problem areas. The CAP Section 107 project was terminated due to the anticipated construction costs exceeding the authorized per-project limit.

Upon further discussions with the Harbor Pilots, it was discovered that an additional problem was a lack of a meeting area within the Harbor. For clarification, vessel meeting is defined as two vessels transiting past one another in opposite directions. This maneuver is different from passing, which is when one vessel overtakes a second vessel transiting in the same direction. At the time, Harbor Pilots were able to utilize the area just north of the Federal channel in St. Simons Sound as an unofficial meeting area since the area has naturally deep water. However, to complete the maneuver, the Harbor Pilots would have to transit outside of the Federal channel and receive USCG permission to do so. The Harbor Pilots identified the area between the Colonel's Island Terminal and the Sidney Lanier Bridge as a possible location for channel widening to create a designated vessel meeting area. A meeting area in this location would be beneficial since vessels would be protected from extreme wind while passing each other and vessels leaving Colonel's Island would not have to wait for incoming vessels to arrive. Furthermore, this is the general area where the tugboats meet up with the RO/ROs to assist with docking at Colonel's Island.

The initial array of alternatives was presented to the Corps' Vertical Team at the Alternative Milestone Meeting held on July 15, 2019 and included:

- Alt. 1: Expand the bend widener in the Cedar Hammock Range near Coast Guard buoy 14
- Alt. 2: Expand the turning basin near Colonel's Island Terminal.
- Alt. 3: Widen the Federal channel between the Sidney Lanier Bridge and the Colonel's Island Terminal to create a RO/RO vessel meeting area
- Alt 4: Combination of Alt. 1 and 2 (expand the bend widener and turning basin)
- Alt 5: Combination of Alt. 1, 2, and 3 (expand bend widener, turning basin, and create meeting area.

The above improvements were initially evaluated along with dredged material disposal options identified for the project including beneficial use. Stakeholders identified five potential beneficial use opportunities as part of the study. Beneficial use sites that were further from the project area than the Andrews Island Dredged Material Containment Area (DMCA) were screened from further consideration. This left two options for consideration:

- Restore Bird Island at St. Simons Sound: Restore area impacted by erosion on Bird Island. This would require approximately 36,000 cubic yards of material.

- Construct a new Bird Island in Brunswick Harbor south of the intersection of Cedar Hammock and Brunswick Point Cut ranges. This would require approximately 200,000+ cubic yards of dredged material.

3.7. Initial Evaluation of Alternatives

In early September 2019, as the PDT was preparing to conduct a Ship Simulation study on the initial array of alternatives, the 656-ft-long RO/RO vessel Golden Ray capsized in Brunswick Harbor. The Golden Ray had departed from Colonel's Island Terminal and capsized just outside of the Federal navigation channel near St. Simon's Sound (Figure 20 from Section 2.15). The cause of the accident is currently under investigation. The vessel removal process is underway and is likely to be complete by the end of 2021.

In response to the Golden Ray event, the USCG issued a Regulated Navigation Area (RNA) order to provide a safe working area for response crews working on the Golden Ray removal. The RNA requires all vessels over 500 gross tons to seek prior approval from the USCG at least 24 hours prior to transiting within the Port of Brunswick and requires one-way vessel traffic at all times. In response to the RNA, the Harbor Pilots submitted a request to the Corps to temporarily widen the channel at St. Simons Sound to create additional maneuverability space around the Golden Ray so the Harbor Pilots would be able to safely use St. Simons Sound as a meeting area. The Harbor Pilot's request to widen the Federal channel caused the BHMS PDT to reexamine the St. Simons Sound Area for inclusion in the study.

Prior to this incident, the Harbor Pilots used the naturally deep water (deeper than -38 feet MLLW) as a vessel meeting area, but it required them to navigate outside the channel after receiving USGC permission to execute the maneuver. While the RNA is temporary and will be lifted once the Golden Ray is removed, USGC has stated they intend to no longer allow vessels to leave the Federal channel (A. McConnell, personal communication, 2020). Therefore, the PDT decided to include an alternative to widen the Federal channel at St. Simons Sound to create a vessel meeting area. This area was included in the Feasibility-level ship simulation effort.

Feasibility-Level Ship Simulation

The USACE Engineer Research and Development Center (ERDC) Coastal Hydraulics Lab (CHL) in Vicksburg, MS from December 2-6, 2019. Two Brunswick Harbor Pilots completed 44 simulated runs under a variety of environmental conditions (including extreme conditions), with data collected on transit time, run difficulty, and run safety. Ship simulation testing focused on configuring channel widening or realignment dimensions at four locations within Brunswick Harbor. The four locations (Figure 16) are:

- Meeting area at St. Simons Sound
- Meeting area west of Sidney Lanier Bridge

- Bend widener near USCG buoy 24 along the Cedar Hammock Range
- Turning basin expansion (4 options)

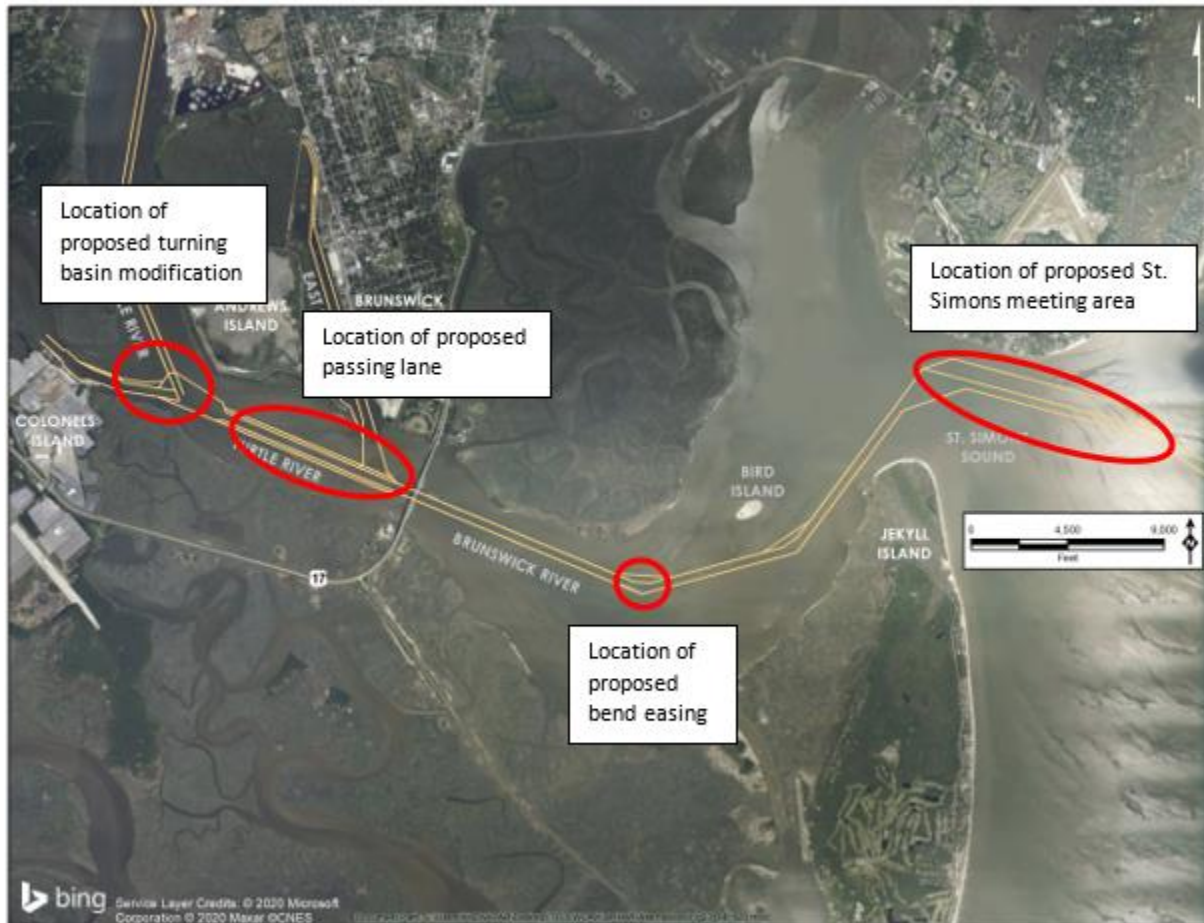


Figure 16. Proposed Brunswick Harbor modification areas

Ship simulation results showed that the meeting area in St. Simons Sound is sufficient for vessels. Also, the passing area located between the turning basin and the Sidney Lanier Bridge was found to be acceptable for two design vessels to safely pass. The length of the tested area (from the Sidney Lanier bridge to the turning basin) is likely a necessity, as a shorter area would make timing difficult. The Harbor Pilots showed little difficulty with the proposed bend widener and the proposed design was found adequate.

Currently, Colonel's Island Terminal has three RO/RO berths available (Berths 1-3), with a fourth berth (Berth 0) permitted for construction (Figure 17). The GPA is undertaking this development project independent of the BHMS (i.e. not a Local Service Facility).

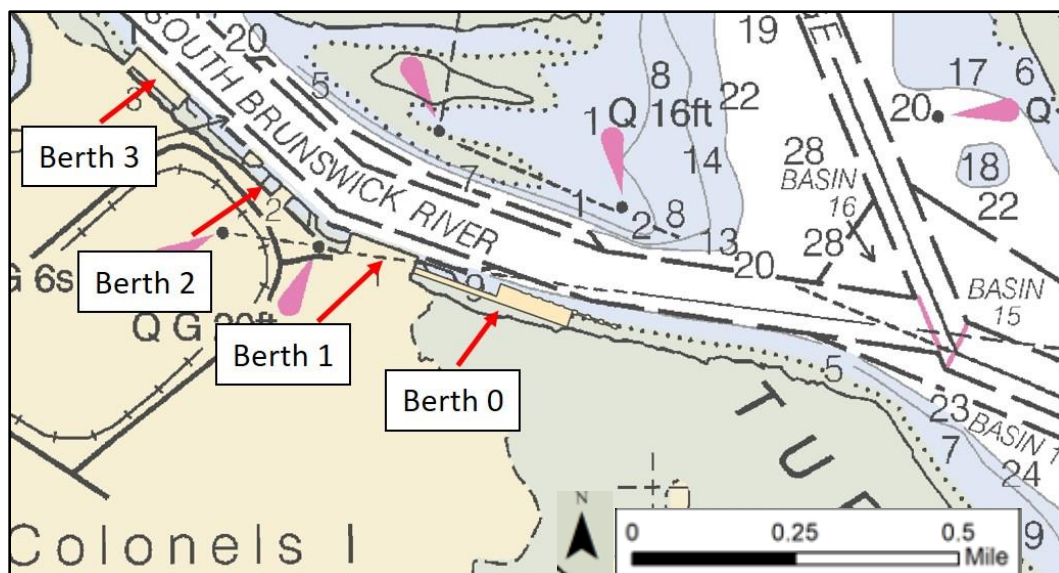


Figure 17. General Berth Location at Colonel's Island

The new berth was included in all ship simulation runs where applicable since its location impacts the turning basin design. Four different turning basin configurations were evaluated during ship simulation. The first two configurations were developed during the CAP Section 107 study in 2011. Upon expert elicitation with Brunswick Harbor Pilots, these two turning basin configurations were screened as they would not provide the needed additional maneuvering space near or upstream of the planned Berth 0. A third turning basin configuration was refined further during ship simulation to create turning basin option four. Turning basin option four incorporates less total width than turning basin option three but has greater upstream length. Ship simulation showed that the increase in vessel maneuverability near Berth 0 from the narrower and longer turning basin configuration was important especially in stronger environmental conditions. Turning basin option four was carried forward into the final array of alternatives. Appendix B contains further discussion on turning basin design and configuration development.

The PDT recognized early in the plan formulation process that there was high risk of beneficial use exceeding the base for the modification study. This is because the most likely beneficial use scenario is restoring Bird Island, however, only 36,000 cubic yards of material would be required for this action. Expanding the bend widener was likely to require much more than 36,000 cubic yards of material. This would mean that one navigation feature would have two disposal locations raising construction costs. A limiting factor for placing dredged material at Bird Island is that the elevation cannot be increased since the island is in the flight path of a local airport and there are Federal Aviation Administration (FAA) concerns about congregating birds. The PDT continued to consider beneficial use throughout the planning process as new information and data was collected over the course of the study. Please see Section 5.2 for the final description of the recommended plan and additional discussion on beneficial use.

3.8. Final Array of Alternatives

With the data from ship simulation plus the firsthand user knowledge provided by the Harbor Pilots, the PDT developed the final array of alternatives carried forward for evaluation. Common to all action alternatives is continued O&M dredging within the Federal navigation channel (approximately 30 miles of channel) at authorized depths (-36 feet MLLW + 2 feet allowable over-depth). Proposed channel widening under the action alternatives would result in approximately 16,900 cubic yards of additional maintenance material annually. Included in the action alternatives is the continued O&M of the Federal navigation channel. Within the O&M analysis there is a distinction between O&M under the No Action Alternative (NAA) versus O&M under the action alternatives. The O&M Action Alternative would be common to all action alternatives. The final array of alternative includes nine alternatives, a NAA and eight action alternatives. These are described below.

Alternative 1: No Action Alternative

The No Action Alternative/Future Without Project Condition (NAA/FWOP) is analyzed for comparison with the action alternatives. Taking no action would mean continuing current operations and restrictions within the Brunswick Harbor Federal Navigation Project with no improvements with no navigation improvements. All physical conditions at the time of this analysis are assumed to remain. The planned berth (Berth 0) at Colonel's Island Terminal and terminal expansion are included in the NAA/FWOP. The NAA/FWOP assumes one-way RO/RO traffic within Brunswick Harbor; however, vessels do occasionally meet in two locations: (1) St. Simons Sound and (2) the Colonel's Island Terminal turning basin. Vessels rarely meet in the turning basin as conditions must be ideal for the maneuver to take place and both pilots must agree to it. Furthermore, it is unlikely that this maneuver will be able to continue once Berth 0 is constructed. Vessel meeting in the St. Simons Sound would occur outside of the Federal Channel with USCG permission. However, since the Golden Ray incident, USCG has stated they intend to no longer allow vessels to leave the Federal Channel (A. McConnell, personal communication, 2020). Therefore, it is reasonable to assume that the Harbor Pilots would abide by the USCG direction into the foreseeable future and it is reasonable to assume one-way vessel traffic within the harbor. Golden Ray salvage operations are expected to be complete prior to project implementation (Figure 18).

The NAA/FWOP also includes continued operation and maintenance (O&M) dredging within the Federal navigation channel at authorized depths (-36 feet MLLW + 2 feet allowable over-depth). Currently, the average annual quantity of O&M material dredged in Brunswick Harbor is approximately 1.6 million cubic yards. This amount includes approximately 390,000 cubic yards in the inner harbor reach and 1,219,000 cubic yards in the outer harbor or entrance channel. Inner harbor dredged material is placed in the Andrews Island Dredged Material Containment Area (DMCA) and entrance channel dredged material is placed in the Brunswick Ocean Dredged Material Disposal Site

(ODMDS). Under the NAA, O&M dredging, using all dredge types including cutterhead suction (cutterhead), clamshell/bucket, bed leveling, and trailing suction hopper dredge (hopper), will occur annually as needed based on shoaling rates.

Additionally, the NAA assumes conditions before the 2020 SARBO, thus according to the terms and conditions of the 1997 SARBO, includes the environmental window for hopper dredging from 1 December – 15 April. Physical and environmental considerations determine the timing, dredge methods, and placement of dredged material. Section 1.5 includes a description of dredging methods. Specific dredging processes for the different reaches of the navigation channel are included below:

Entrance Channel Maintenance Dredging

Entrance channel maintenance dredging occurs on an annual basis. While the Corps may use all types of dredging to maintain the entrance channel, the preferred method is hopper dredging. As noted above, hopper dredges are mobile and suitable for areas of high traffic and rough seas. Therefore, hopper dredges are the most effective dredge type in the entrance channel as they can continue to operate during periods of rough waves and can easily move out of the way of large vessels traversing the channel. Because hopper dredges are mobile, they also move efficiently throughout the entrance channel during dredging.

In comparison, cutterhead and clamshell dredges are immobile and are not able to operate during periods of rough seas. Furthermore, as all dredged material placed in the ODMDS requires bottom dump placement, production is limited to the capacity and number of scows/barges available to transport the material to the ODMDS. For cutterheads, unless there is an uninterrupted line of scows to receive material, dredging would have to stop while the material is transported for disposal and the advantage of a pipeline's continuous dredging is not realized. Additionally, for both clamshell and cutterhead dredging, the need to demobilize and move equipment between dredging sections also creates delays. The downtime for demobilization/mobilization, work stoppage for rough seas, and transport delays all result in cutterhead and clamshell being substantially less efficient than hopper dredging. For these reasons, clamshell/cutterhead dredge methods although available as a dredge method, are rarely if ever used in the entrance channel. Table 18 summarizes entrance channel dredging under the NAA/FWOP.

Table 18. Summary of Entrance Channel Dredging under the NAA/FWOP

<u>Dredge Type</u>	<u>Timing</u>	<u>Frequency/Duration</u>	<u>Transport/Disposal</u>	<u>Disposal Site</u>
Hydraulic				
Hopper	December 1 to April 15 ¹	Annually (1-3 months duration)	Bottom Dump ²	ODMDS
Cutterhead	All Year	Rarely (~twice as long as hopper)	Scow/Bottom Dump	ODMDS
Mechanical				
Bucket/Clamshell	All Year	Rarely- substantially longer timeframe than hydraulic dredge and may not be able to complete in one dredge cycle.	Scow/Bottom Dump	ODMDS
Bed Leveler ³	All Year	Annually	NA	NA
1. 1997 SARBO Environmental Window 2. Current Section 103 approval for ODMDS disposal is bottom dump (scow or hopper with split hull or bottom doors) 3. Bed leveling is used to move material from high spots to low spots and complements the other dredge methods. Bed leveling equipment currently follows the Brunswick design.				

Inner Harbor

Maintenance dredging in the Inner Harbor occurs on an annual basis. Preferred method of dredging in the Inner Harbor is cutterhead dredging, as material can be pumped directly to the Andrews Island DMCA, allowing for continuous dredging. Bucket/clamshell dredging occurs infrequently and on an as needed basis. There are no environmental windows for dredging in the Inner Harbor. Table 19 summarizes the different dredge methods available for use in the inner harbor.

Table 19. Summary of Inner Harbor Dredging under the NAA/FWOP

<u>Dredge Type</u>	<u>Timing</u>	<u>Frequency/Duration</u>	<u>Transport/Disposal</u>	<u>Disposal Site</u>
Hydraulic				
Cutterhead	All Year	Annually	Pipeline	Andrews Island DMCA
Mechanical				
Bucket/Clamshell	All Year	Infrequently	Scow/Bottom Dump ¹	ODMDS ² / Andrews Island DMCA
Bed Leveler ³	All Year	Annually	NA	NA
1. Current Section 103 approval for ODMDS placement is bottom dump (scow or hopper with split hull or bottom doors) 2. If from reach that has been tested suitable for ODMDS placement.				

3. Bed leveling is used to move material from high spots to low spots and conducted in conjunction with the other dredge methods. Bed leveling equipment must follow the Brunswick design.

Cedar Hammock Range

Maintenance dredging in the Cedar Hammock Range may be included in entrance channel, inner harbor dredge contracts, or as standalone contracts depending on maintenance needs. As stations 12+750 to 22+000 are currently approved (tested suitable) for ODMDS, this reach may be hopper dredged with material placed in the ODMDS. However, if cost effective, Cedar Hammock may also be maintained using cutterhead dredging with material placed in Andrews Island DMCA. Clamshell dredging is also infrequently conducted within Cedar Hammock. Because clamshell dredging can leave an uneven surface, bed leveling is used as a final clean-up phase.



Figure 18. Alternative 1 – No Action/ Future Without-Project Condition

Alternative 2: Bend Widener

Alternative 2 would expand the Cedar Hammock Range bend widener located between stations 20+300 to 23+300. The bend widener would be expanded by a maximum of 321 feet on the north side and at a length of approximately 2,700 feet. The bend widener would be dredged to a depth of -38 feet MLLW (-36 feet MLLW plus 2 feet of allowable over-depth). Approximately 205,000 cubic yards of material would be dredged to expand the bend widener. A cutterhead dredge is the most likely dredging method for this alternative. The dredged material would be placed in the Andrews Island Dredged Material Containment Area (DMCA).

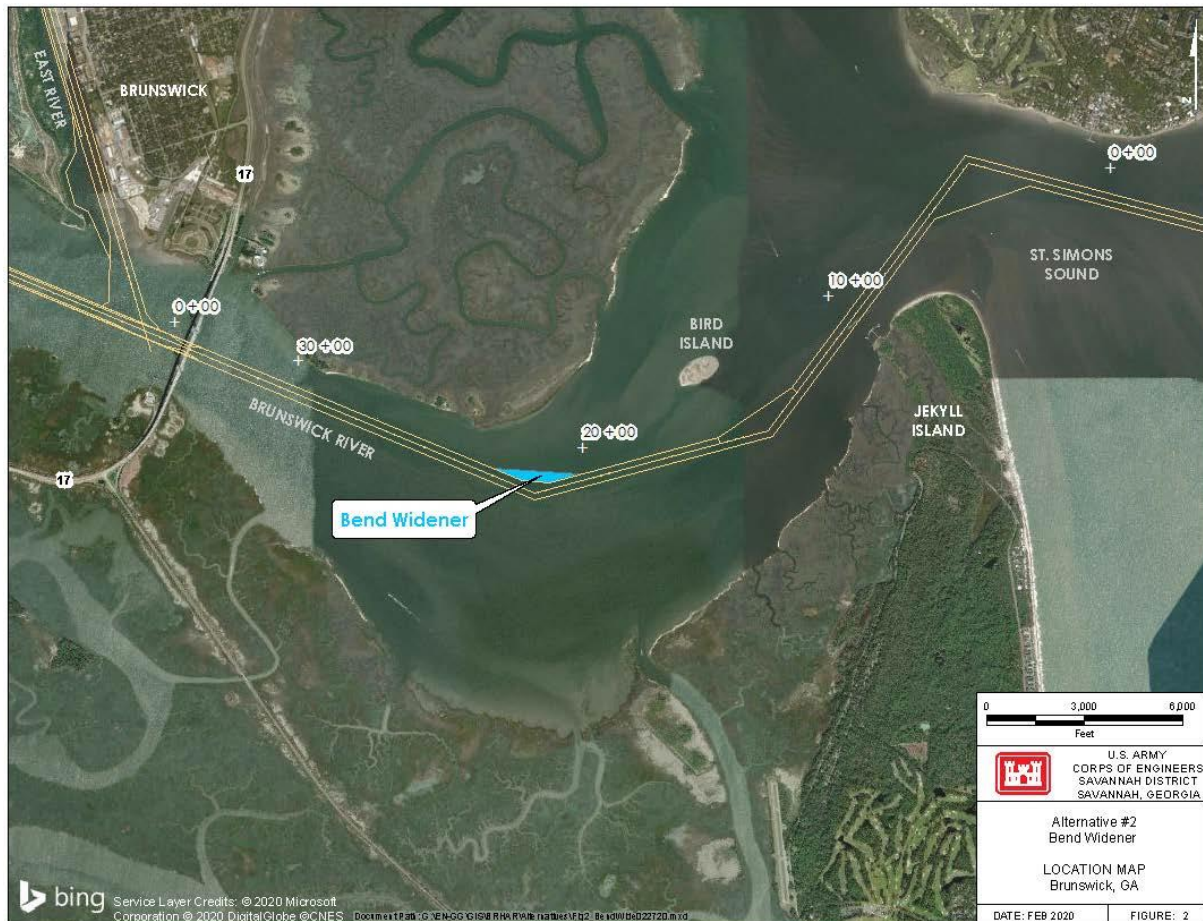


Figure 19. Alternative 2 – Bend widener at buoy 24 in vicinity of Cedar Hammock Range

Alternative 3: Turning Basin Expansion

Alternative 3 would expand the existing turning basin at Colonel's Island Terminal along approximately 4,100 feet and increase the width by a maximum of 395 feet along South Brunswick River from stations 0+900 to 5+300. The turning basin expansion would be dredged to a depth of -38 feet MLLW (-36 feet MLLW plus 2 feet of allowable over-depth). Approximately 346,000 cubic yards of dredged material would be removed. A cutterhead dredge is the most likely dredging method for this alternative. All dredged material would be placed in the Andrews Island DMCA.

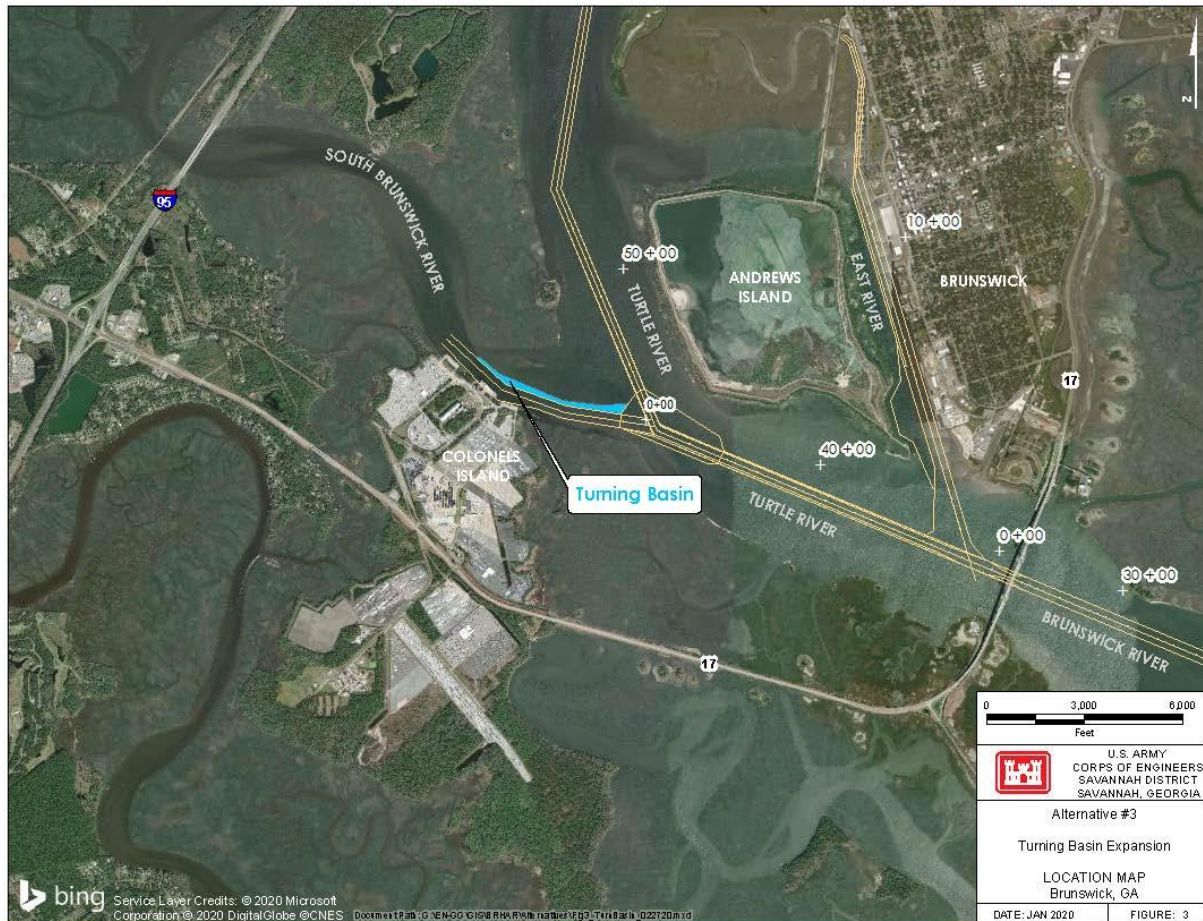


Figure 20. Alternative 3 – Turning basin expansion near Colonel's Island Terminal

Alternative 4: Meeting Area West of Sidney Lanier Bridge

Alternative 4 would create a RO/RO vessel meeting area upstream of the Sidney Lanier Bridge to the turning basin at Colonel's Island Terminal (a distance of approximately 8,700 feet). This part of the Federal Channel is currently 400 feet wide. The Federal Channel would be expanded by approximately 200 feet on both the north and south side of the channel to create a new channel width of 800 feet from stations 34+200 to 43+200. The meeting area would be dredged to a depth of -38 feet MLLW (-36 feet MLLW plus 2 feet of allowable over-depth). Approximately 800,000 cubic yards of material would be dredged. All dredged material would be placed in the Andrews Island DMCA.

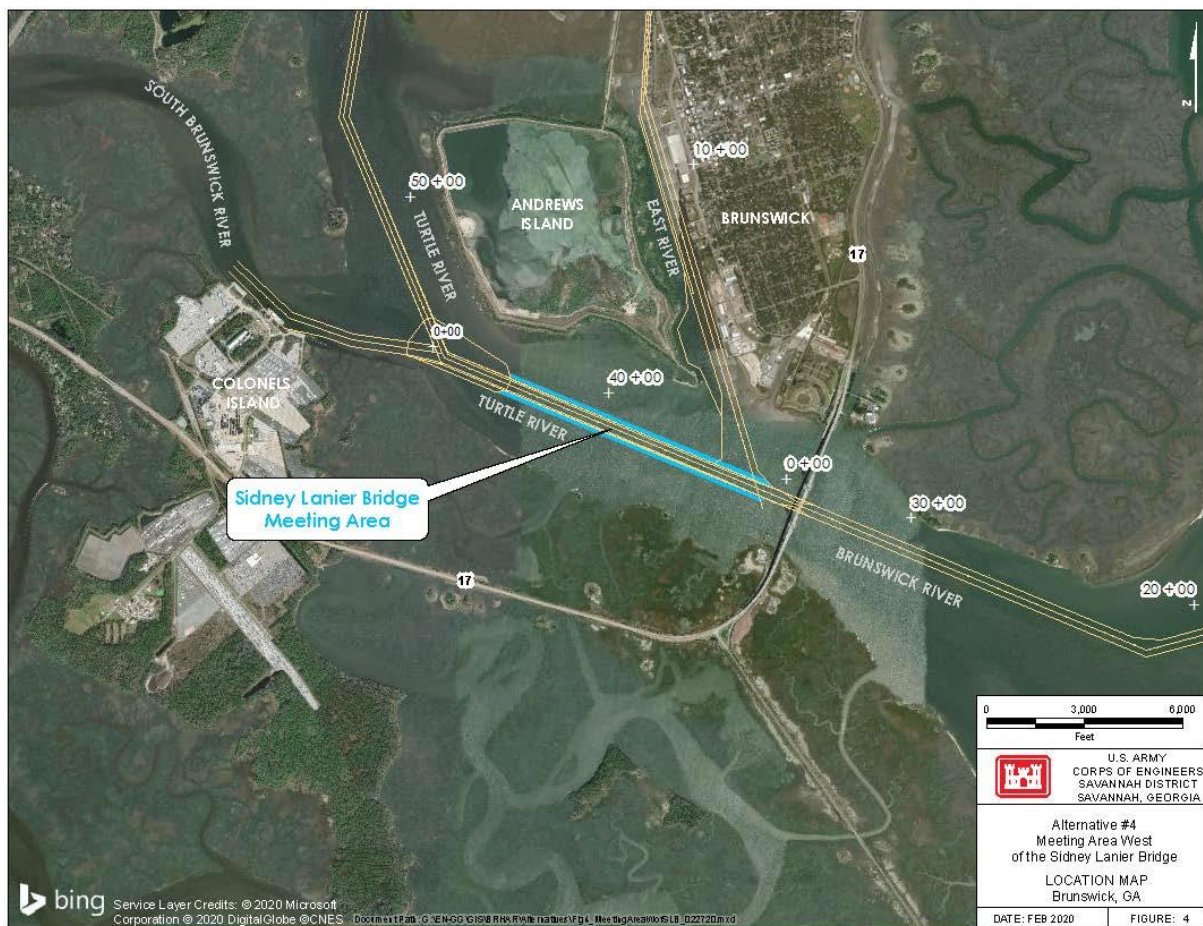


Figure 21. Alternative 4 – Meeting area west of the Sidney Lanier Bridge

Alternative 5: Meeting Area at St. Simons Sound

Alternative 5 would create a RO/RO vessel meeting area located at St. Simons Sound near the Brunswick Harbor entrance channel. No dredging is required for this alternative since the area has naturally deep water. Creating a meeting area at St. Simons Sound would move the northern boundary of the existing channel approximately 800 feet to the north along a length of approximately 10,000 feet from stations -6+800 to 4+300. The existing channel centerline would not change. Costs for this alternative are associated with cultural resource preservation surveys and associated engineering work to update the channel design. There are no physical modifications required for this alternative. Alternative 5 removes the requirement for USCG approval for meeting since the Federal channel would be widened enough for two RO/RO vessels to meet and transit past each other. Therefore, the Harbor Pilots would not need to transit outside the channel.



Figure 22. Alternative 5 – Meeting area at St. Simons Sound

Alternative 6: Bend Widener and Turning Basin Expansion

Alternative 6 is a combination of the bend widener (Alternative 2) and the turning basin expansion (Alternative 3). A cutterhead dredge is the most likely dredging method for this alternative and dredged material would be disposed of in Andrews Island DMCA.



Figure 23. Alternative 6 – Bend widener and turning basin expansion

Alternative 7: Bend Widener, Turning Basin Expansion, and Meeting Area West of Sidney Lanier Bridge.

Alternative 7 is a combination of the bend widener (Alternative 2), turning basin expansion (Alternative 3), and meeting area west of the Sidney Lanier Bridge (Alternative 4).



Figure 24. Alternative 7 – Bend widener, turning basin expansion, and meeting area west of Sidney Lanier Bridge

Alternative 8: Bend Widener, Turning Basin Expansion, and Meeting Area at St. Simons Sound.

Alternative 8 is a combination of the bend widener (Alternative 2), turning basin expansion (Alternative 3), and meeting area at St. Simons Sound (Alternative 5). A cutterhead dredge is the most likely dredging method for this alternative and dredged material would be disposed of in Andrews Island DMCA.

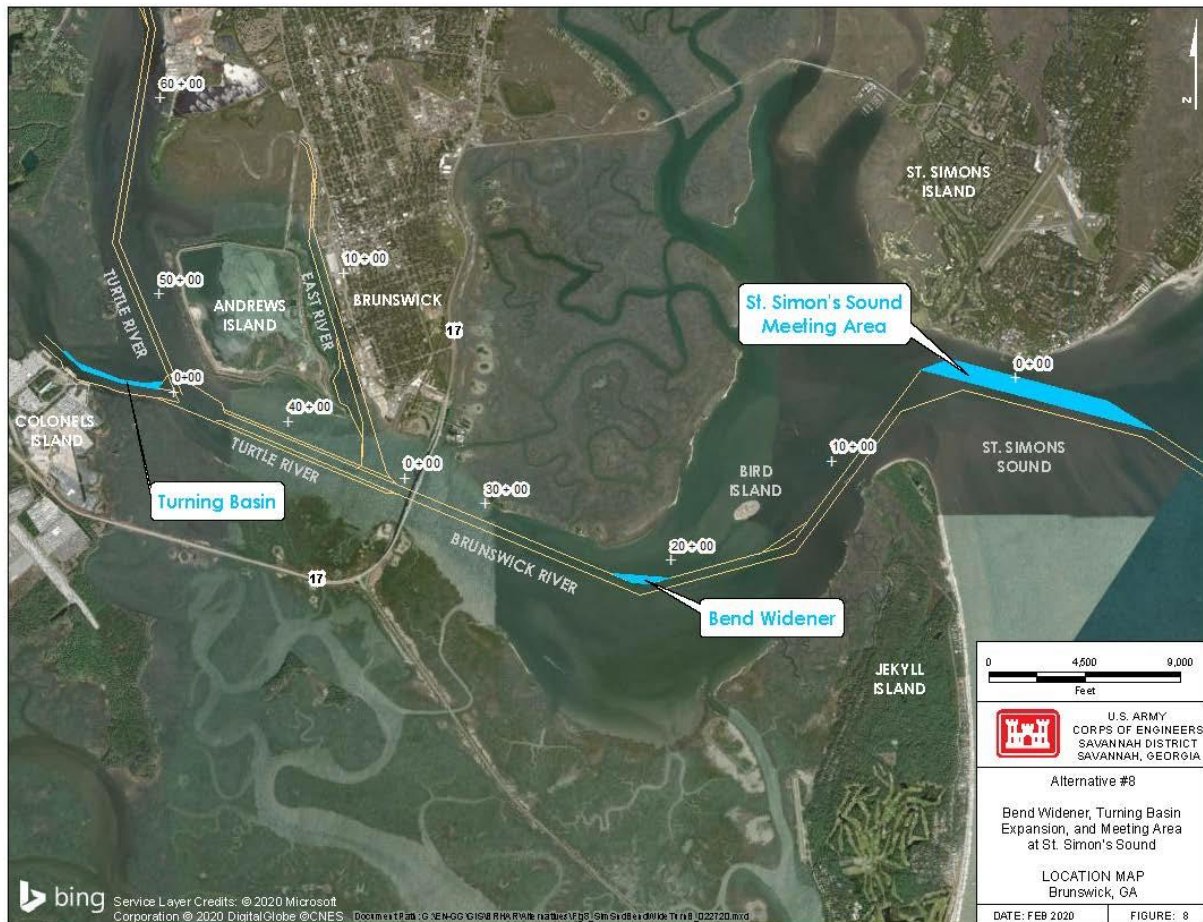
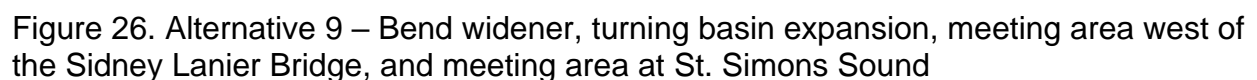


Figure 25. Alternative 8 – Bend widener, turning basin expansion, and meeting area at St. Simons Sound

Alternative 9 is a combination of the bend widener (Alternative 2), turning basin expansion (Alternative 3), meeting area west of the Sidney Lanier Bridge (Alternative 4), and meeting area at St. Simons Sound (Alternative 5).



Common to all Action Alternatives, the Corps would continue to conduct O&M of the federal navigation channel, incorporating the 2020 SARBO for maintenance dredging and other covered activities for the entire Brunswick Harbor Navigation Project (30-miles of authorized Federal channel). All dredging methods and other covered activities as described in the 2020 SARBO may be used for O&M dredging. O&M dredging uses all dredge types including cutterhead suction (cutterhead), clamshell/bucket, bed leveling, relocation trawling, and trailing suction hopper dredge (hopper), will occur annually as needed based on shoaling rates.

Incorporation of the 2020 SARBO includes replacing seasonal windows with a risk-based management approach, which considers risk to multiple species in a given area. The risk-based management plan is outlined in Section 2.9.2 in the 2020 SARBO. The 2020 SARBO added seasonal restrictions on projects occurring in rivers where Atlantic and shortnose sturgeon occur, and modified seasonal protective measures required in areas where and when North Atlantic right whales (NARW) may be present, while taking into account the need for continued protections for ESA-listed sea turtles (2020 SARBO, page 644), including in areas, such as Brunswick Harbor, where other protected species (such as NARW) are present. The Corps would follow the risk-based adaptive management process outlined in the 2020 SARBO, as detailed in the 2020 SARBO Appendix J. Additionally, the Corps would follow the 2020 SARBO Project Design Criteria (PDC) at 2020 SARBO Appendix B for dredging equipment, which includes, but is not limited to the following:

- Hopper dredging- During all hopper dredging operations, NMFS-approved observers will monitor for the presence of ESA-listed species. To prevent impingement or entrainment of ESA-listed species within the water column, dredging pumps will be disengaged by the operator when the dragheads are not actively dredging and therefore working to keep the draghead firmly on the bottom. Pumping water through the dragheads is not allowed while maneuvering or during travel to/from the placement site. All waterport or other openings on the hopper dredge are required to be screened to prevent ESA-listed species from entering the dredge. A state-of-the-art solid-faced deflector that is attached to the draghead must be used on all hopper dredges at all times.

Other than replacement of the seasonal window with risk-based adaptive management (i.e. no specific seasonal window), the 2020 SARBO PDCs for hopper dredging are substantially similar to the minimization measures the Corps uses for hopper dredging as described in the NAA and Section 1.5. As described under the NAA, hopper dredging is the preferred method of dredging in the entrance channel, this would not change under the Action Alternatives.

- Cutterhead dredging- not be engaged/turned on when not embedded in the sediment, to the maximum extent possible. Additional monitoring requirements for sturgeon are also required under the 2020 SARBO.

Incorporation of 2020 SARBO does not result in a change in the timing or location of cutterhead dredging or the transport and placement of dredged material resulting from cutterhead dredging, as described under the NAA and Section 1.5.

- Bed-levelers- design that produces a sand wave in front of the leading face of the bed-leveling device such that it disturbs species off the sea/channel floor bottom. All support structures must be welded to prevent impingement or “pinch points” for passing ESA-listed species. The design analyzed in the Brunswick Harbor study is approved to meet these requirements (Dodd 2003). The bed-leveler will

be slowly lowered to the sea/channel bottom and the depth of the bed-leveler adjusted constantly to meet required depth and to compensate for tidal fluctuations. The bed-leveler will be towed/pushed along the bottom no faster than needed to move the material at the sea/channel bottom (approximately 1-2 knots). The bed-leveler design as approved in 2020 SARBO, is in use in Brunswick Harbor and the Corps would continue to employ this design.

Although not specifically authorized in the 1997 SARBO, bed-leveling was a common practice as part of the dredging process, and the Brunswick design is substantially similar to the design restrictions in the 2020 SARBO. Therefore, the bed-leveler PDCs in the 2020 SARBO would not result in a change to current bed-leveling practices in the southeast. However, the NAA assumes the use of the Brunswick design bed leveler.

- The 2020 SARBO requires additional reporting and monitoring requirements for the covered ESA-listed species.

These requirements do not result in changes to dredging, placement, or other covered activities as described under the NAA and Section 1.5.

All other maintenance dredging activities as described under the NAA would remain the same. Table 20 and Table 21 summarize O&M dredging activities common to all action alternatives. The frequency/duration column is representative of how often the Corps may employ a dredging equipment type based on the conditions in that reach of the navigation channel. However, the dredging equipment may be used more frequently on an as needed basis.

Table 20. Summary of the Entrance Channel and Cedar Hammock O&M Dredging Methods under the Action Alternatives dredging entrance channel, purple highlights changes from the NAA.

<u>Dredge Type</u>	<u>Timing</u>	<u>Frequency/Duration</u>	<u>Transport/Disposal</u>	<u>Disposal Site</u>
Hydraulic				
Hopper	All Year	Annually (1-3 months duration)	Bottom Dump ¹	ODMDS
Cutterhead	All Year	Rarely (~twice as long as hopper)	Scow/Bottom Dump	ODMDS
Mechanical				
Bucket/Clamshell	All Year	Rarely- substantially longer timeframe than hydraulic dredge and may not be able to complete in one dredge cycle.	Scow/Bottom Dump	ODMDS
Bed Leveler ²	All Year	Annually	NA	NA
1. Current Section 103 approval for ODMDS disposal is bottom dump (scow or hopper with split hull or bottom doors)				

2. Bed leveling is used to move material from high spots to low spots and complements the other dredge methods. Bed leveling equipment would be the 2020 SARBO approved design in Appendix B.

Table 21. Summary of the Inner Harbor and Cedar Hammock O&M Dredging Methods under the Action Alternatives

<u>Dredge Type</u>	<u>Timing</u>	<u>Frequency/Duration</u>	<u>Transport/Disposal</u>	<u>Disposal Site</u>
Hydraulic				
Cutterhead	All Year	Annually	Pipeline	Andrews Island DMCA
Mechanical				
Bucket/Clamshell	All Year	Infrequently	Scow/Bottom Dump ¹	ODMDS ² / Andrews Island DMCA
Bed Leveler ³	All Year	Annually	NA	NA
<ol style="list-style-type: none"> 4. Current Section 103 approval for ODMDS placement is bottom dump (scow or hopper with split hull or bottom doors) 5. If from reach that has been tested suitable for ODMDS placement. 6. Bed leveling is used to move material from high spots to low spots and complements the other dredge methods. Bed leveling equipment would be the 2020 SARBO approved design in Appendix B. 				

The Corps proposes to replace historic hopper dredge environmental window with the risk-based adaptive management process outlined in the 2020 SARBO, as detailed in Appendix J of the 2020 SARBO. Maintenance dredging would no longer be constrained to the environmental window that is in the 1997 SARBO. The risk-based adaptive management process is needed to provide maximum flexibility for minimizing the risk to ESA-listed species. An additional benefit is the ability to obtain contract dredges when maintenance dredging is most needed. Removing window restrictions would also allow dredges to continue working until project completion, as long as risk across listed species is minimized, rather than having to stop maintenance dredging when the end of the window was reached and completing under the next maintenance dredge cycle. Additionally, following the risk-based adaptive management process for hopper dredging would alleviate the need to sometimes limit the scope of dredging to the bare minimum needed to keep channels open, as there would be greater opportunity to complete the work at a time that minimizes risk across listed species. This would allow the Corps to perform maintenance dredging to full authorized project dimensions.

The 2020 SARBO risk-based management approach allows for dredging during any time of year. Understanding the effects to species from hopper dredging continues to evolve. Historic hopper dredging windows started in the 1980s with a focus on sea turtle protection by using time of year as the minimization measure. As the number of ESA-listed species in the area has increased and more information has been gathered about effects to all species from hopper dredging, a more comprehensive approach to protection of ESA-listed species was needed. As noted on p.644 of the 2020 SARBO: "Many of the ESA-listed species within the action area have overlapping ranges and

habitats, and some protective measures frequently applied to projects for certain ESA-listed species conflict with protection of other listed species or critical habitats in these overlapping areas. The SARBO Team gave extensive consideration to which ESA-listed species could be affected by an activity covered under this Opinion, the probability of exposure based on project timing and anticipated species abundance in an area, and how to maximize protections for all ESA-listed species and designated critical habitat.” This extensive consideration led to the development of the risk-based process as outlined in the 2020 SARBO. This process includes a pre-construction assessment step that considers how and when dredging is completed and determining minimization measures to reduce risk to species (2020 SARBO).

Risk-assessment under the 2020 SARBO is an internal, ongoing deliberative process to evaluate risk associated with a specific project such as Brunswick and all projects region-wide that are covered under the 2020 SARBO. The risk assessment process is detailed in Appendix J of the 2020 SARBO. Since it is not a one-time decision, it may result in different recommendations year after year based on an increasing understanding of the species and habitat in the area and the site-specific conditions that could affect the success of the project. This continued analysis includes regular coordination with the fellow action agencies involved in the 2020 SARBO (i.e., NMFS and BOEM). It also anticipates coordination with others on an as needed basis including resource managers, academia, dredging contractors, and others to evaluate new data/publications that may be relevant to the analysis. The factors that will be considered are not limited to effects to species and habitat, but also consider the ability for various equipment types to work effectively in specific areas and under specific conditions and the cost and availability of that equipment (It also considers how the timing of individual projects effects the availability of other projects regionally and nationally (2020 SARBO, Appendix J).

The 2020 SARBO provides an analysis of the risk to ESA-listed species under NMFS purview based on information available and lessons learned from past dredging events. However, all work is limited by the amount of take allowed for each species under the 2020 SARBO for all projects covered under the Opinion from North Carolina, South Carolina, Georgia, Florida, US Virgin Islands, and Puerto Rico (2020 SARBO).

3.9. Evaluation and Comparison of Final Array of Alternatives

Completeness, Effectiveness, Efficiency, and Acceptability

The developed alternatives were verified against the four Principles and Guidelines formulations criteria (Table 22). The completeness, effectiveness, efficiency, and acceptability criteria originated in the Principles and Guidelines, published in 1983 by the U.S. Water Resources Council and are used during the Federal study process for water resources planning.

- Completeness: The extent to which each plan includes all the necessary project components to obtain the desired results.

- Effectiveness: The extent to which an alternative plan alleviates the specified problems and achieves the specified alternatives.
- Efficiency: The alternative meets the objective in the least costly fashion while providing a positive net benefit.
- Acceptability: The workability and viability of an alternative plan with respect to acceptance by State and local entities, tribes, and the public, and compatibility with existing laws, regulations, and public policies.

Table 22. Principles and Guidelines Criteria

Alternative	Completeness	Effectiveness	Efficiency	Acceptability
No Action Alternative	No	No	No	No
Alt. 2	Yes	Yes	Yes	Yes
Alt. 3	Yes	Yes	Yes	Yes
Alt. 4	Yes	Yes	No	Yes
Alt. 5	Yes	Yes	Yes	Yes
Alt. 6	Yes	Yes	Yes	Yes
Alt. 7	Yes	Yes	Yes	Yes
Alt. 8	Yes	Yes	Yes	Yes
Alt. 9	Yes	Yes	Yes	Yes

Based on the screening and evaluation criteria above, the No Action Alternative, does not meet the minimum standard of completeness since it does not include all the necessary project components to obtain the desired results (i.e. reducing transportation inefficiencies). However, the No Action Alternative is carried forward through the evaluation phase as required by NEPA. All other action alternatives are considered complete because they provide for necessary actions to ensure that the objectives are met.

All action alternatives are considered effective at reducing transportation costs. The No Action Alternative does not effectively reduce transportation costs. Alternative 4 is not considered efficient because costs exceed benefits (see Table 23). The other action alternatives are considered cost effective. All action alternatives are acceptable in regard to being workable and viable with respect to acceptance by State and local entities and the public and compatibility with existing laws, regulations, and public policies. The no action alternative is not acceptable since it would not be in compliance with the 2020 SARBO.

National Economic Development, Regional Economic Development, Environmental Quality, and Other Social Effects

The evaluation and comparison process incorporated four accounts to facilitate evaluation and display of effects of alternative plans. The four accounts are national

economic development (NED), environmental quality (EQ), regional economic development (RED) and other social effects (OSE). The Federal objective is to determine the project alternatives with maximum net benefits while protecting or minimizing impacts to the environment. Recent USACE guidance (5 January 2021 SACW Memo, "SUBJECT: POLICY DIRECTIVE – Comprehensive Documents of Benefits in Decision Document" (referred to as the Benefits Memo)) directed feasibility studies to "ensure the USACE decision framework considers, in a comprehensive manner, the total benefits of project alternatives, including equal consideration of economic, environmental and social categories." The following section provides an assessment of the alternatives across the four accounts in accordance with the referenced benefits memo. Since the Tentatively Selected Plan (TSP) milestone occurred prior to the release of the Benefits Memo, a qualitative assessment of benefits for the RED, EQ, and OSE accounts is acceptable. Table 23 summarizes differences between the alternatives across the four accounts.

Table 23. Alternative Plans Summary Comparison

Table 23: Alternative Plans Summary Comparison for Brunswick Modifications Study, GA									
1. Plan Description*	1. No Action Alternative/Future Without Project Condition	2. Bend Widener (dredge 205,000 yd³ to expand bend widener dimensions)	3. Turning Basin Expansion (dredge 346,000 yd³ to expand turning basin dimensions)	4. Meeting area west of Sidney Lanier Bridge (dredge 800,000 yd³ to create a vessel meeting area)	5. St. Simon's Sound Meeting Area (re-design current Federal channel configuration to create a vessel meeting area. No dredging required due to naturally deep water)	6. Bend Widener + Turning Basin Expansion (dredge 551,000 yd³ to expand bend widener and turning basin dimensions)	7. Bend Widener + Turning Basin Expansion + Meeting Area West of Bridge (dredge 1,352,000 yd³ to expand channel dimensions at identified locations)	8. Bend Widener + Turning Basin Expansion + St. Simon's Meeting Area (dredge 551,000 yd³ to expand channel dimensions at identified locations) NED PLAN (updated with FY21 certified cost information)	9. Bend Widener + Turning Basin Expansion + Meeting Area West of Bridge + St. Simon's Sound Meeting Area (dredge 1,352,000 yd³ to expand channel dimensions at identified locations)
2. IMPACT ASSESSMENT									
A. National Economic Development (NED) ³									
(1) Project Costs (2) Annual Costs (3) Total Annual Benefits (4) Annual Net Benefits (5) Benefit to Cost Ratio	N/A	(1) \$9,445,000 (2) \$346,000 (3) \$1,020,000 (4) \$674,000 (5) 2.9	(1) \$8,462,000 (2) \$432,000 (3) \$1,254,000 (4) \$822,000 (5) 2.9	(1) \$20,569,000 (2) \$725,000 (3) \$284,000 (4) \$-441,000 (5) 0.4	(1) \$899,000 (2) \$34,000 (3) \$95,000 (4) \$61,000 (5) 2.8	(1) \$14,368,000 (2) \$654,000 (3) \$2,846,000 (4) \$2,192,000 (5) 4.4	(1) \$31,390,000 (2) \$1,273,000 (3) \$2,951,000 (4) \$1,678,000 (5) 2.3	(1) \$13,804,000 (2) \$637,000 (3) \$2,943,000 (4) \$2,306,000 (5) 4.6	(1) \$32,027,000 (2) \$1,279,000 (3) \$3,048,000 (4) \$1,769,000 (5) 2.4
B. Environmental Quality (EQ)									
(1) Hydrology and Floodplains	No changes expected								
(2) Aquatic Resources and Habitat	No change	Minor and short-term impacts expected during the construction phase.			No change	Minor and short-term impacts expected during the construction phase.			
(3) Essential Fish Habitat	No adverse effects								
(4) Wetlands	No impacts expected								
(5) T&E Species	May affect but not likely to adversely affect the following species: Kemp's ridley sea turtle, Hawksbill sea turtle, Green sea turtle, Loggerhead sea turtle, Leatherback see turtle, Giant manta ray, Shortnose sturgeon, Atlantic sturgeon, West Indian Manatee								
(6) Air Quality	No change	Minor and short-term impacts expected during the one-year construction period			No change	Minor and short-term impacts expected during the one-year construction period			
(7) Water Quality	No change	Minor temporary adverse effects during the one-year construction period			No change	Minor temporary adverse effects during the one-year construction period			

³ Please note that conceptual costs developed at the FY20 price level with a 2.75% discount rate are used for Alternatives 2 – 7 and 9. Since alternative 8 was identified as the NED plan, a certified cost estimate was developed in FY21. NED information presented for Alternative 8 is based on the FY21 certified cost estimate and the 2.5% discount rate. The information is displayed in Table 19 for informational purposes.

Table 23: Alternative Plans Summary Comparison for Brunswick Modifications Study, GA									
1. Plan Description*	1. No Action Alternative/Future Without Project Condition	2. Bend Widener (dredge 205,000 yd³ to expand bend widener dimensions)	3. Turning Basin Expansion (dredge 346,000 yd³ to expand turning basin dimensions)	4. Meeting area west of Sidney Lanier Bridge (dredge 800,000 yd³ to create a vessel meeting area)	5. St. Simon’s Sound Meeting Area (re-design current Federal channel configuration to create a vessel meeting area. No dredging required due to naturally deep water)	6. Bend Widener + Turning Basin Expansion (dredge 551,000 yd³ to expand bend widener and turning basin dimensions)	7. Bend Widener + Turning Basin Expansion + Meeting Area West of Bridge (dredge 1,352,000 yd³ to expand channel dimensions at identified locations)	8. Bend Widener + Turning Basin Expansion + St. Simon’s Meeting Area (dredge 551,000 yd³ to expand channel dimensions at identified locations) NED PLAN (updated with FY21 certified cost information)	9. Bend Widener + Turning Basin Expansion + Meeting Area West of Bridge + St. Simon’s Sound Meeting Area (dredge 1,352,000 yd³ to expand channel dimensions at identified locations)
(8) Cultural Resources	No impacts to cultural resources or historic properties	Potential for negative impacts to cultural resources. As part of the Programmatic Agreement with GA HPD, surveys will occur prior to construction during the design phase of the project.							
(9) Recreation	No impacts expected								
(10) Aesthetics	No impacts expected								
(11) Noise	No change	Minor impacts during the one-year construction period			No change	Minor impacts during the one-year construction period			
(12) HTRW	No increased risk of disturbance or increase risk of spills								
(13) Climate Change	No change in water levels from existing conditions								
(14) Environmental Justice	No adverse effects expected								
C. Regional Economic Development (RED)									
	No change to the regional economy	Lesser regional economic impact compared to Alt 8.	Lesser regional economic impact compared to Alt 8.	Greater regional economic impact compared to Alt 8.	Minimal impact to the regional economy since no dredging is required.	Lesser regional economic impact compared to Alt 8.	Greater regional economic impact compared to Alt 8.	Harbor modifications and increased O&M expenditures would likely result in short-term increases in local spending, tax revenue, economic output, and full-time employment positions.	Greater regional economic impact compared to Alt 8.
D. Other Social Effects (OSE)									
(1) Life, Health and Safety	No change.	Increases Harbor Pilot perception of safety due to widened channel locations.							
(2) Availability of material for local use	No change.	Up to 250,000 yd³ available for use	Up to 346,000 yd³ available for use	Up to 800,000 yd³ available for use	No material placed in Andrews Island DMCA.	Up to 551,000 yd³ available for use	Up to 1,352,000 yd³ available for use	Up to 551,000 yd³ available for use	Up to 1,352,000 yd³ available for use

National Economic Development (NED)

The NED account displays changes in the economic value of the national output of goods and services. Economic benefits were calculated using the USACE Institute for Water Resources (IWR) HarborSym Model. IWR developed HarborSym as a planning level, general-purpose model to analyze the transportation costs of various waterway modifications within a harbor. HarborSym is a Monte Carlo simulation model of vessel movements at a port for use in economic analyses.

Channel improvement modifications (i.e. channel widening and turning basin expansion) in Brunswick Harbor result in reduced transportation cost by creating fewer delays and less congestion when traversing the port. Furthermore, the creation of a meeting area reduces wait times within the harbor. Appendix A includes a detailed description of the economic model, economic analyses, and benefits. Conceptual cost estimates for the alternatives and the results of the economic analysis are displayed in Table 24 at the FY20 price level and 2.75% discount rate.

Table 24. BHMS Alternatives Comparison Summary based on conceptual costs (FY20 prices, 2.75% discount rate)

Alternative	Project First Cost FY20 (\$1,000s)	Quantities Dredged (yd ³)	AAEQ Benefit	AAEQ Cost	Net Benefit	BCR
No Action	-	-	-	-	-	-
Alt 2. Bend Widener	\$9,445,000	205,159	\$1,020,000	\$346,000	\$674,000	2.9
Alt 3. Turning Basin expansion	\$8,462,000	346,462	\$1,254,000	\$432,000	\$822,000	2.9
Alt 4. West of Sidney Lanier Bridge	\$20,569,000	800,074	\$284,000	\$725,000	-\$441,000	0.4
Alt 5. St Simons Sound	\$899,000	-	\$95,000	\$34,000	\$61,000	2.8
Alt 6. Bend Widener + Turning Basin	\$14,368,000	551,621	\$2,846,000	\$654,000	\$2,192,000	4.4
Alt 7. Bend Widener + Turning Basin + Area West of Bridge	\$31,930,000	1,351,695	\$2,951,000	\$1,273,000	\$1,678,000	2.3
Alt 8. Bend Widener + Turning Basin + St. Simons Sound	\$15,312,000	551,621	\$2,943,000	\$690,000	\$2,253,000	4.3
Alt 9. Bend Widener + Turning Basin + Area West of Bridge + St. Simons Sound	\$32,027,000	1,351,695	\$3,048,000	\$1,279,000	\$1,769,000	2.4

The NED plan is the plan which reasonably maximizes annual net benefits. The annual net benefits of an improvement plan are equal to its annual benefits minus its annual costs. The annual benefits, annual costs, benefit-cost ratio (BCR), and annual net benefits for each alternative were evaluated and compared using outputs calculated at the FY20 discount rate of 2.75 percent and conceptual level cost estimates. Since Alternative 4 has negative net benefits it is screened out from selection as the recommended plan.

Alternative 8 has the most net benefits; however, Alternative 6 has similar net benefits. The two alternatives produce no significantly different levels of net benefits and are within 5 percent of each other in respect to net benefits. In situations like this, according to ER 1105-2-100, Appendix G, Exhibit G-1 General Evaluation Guidelines, the lower cost alternative would be selected as the NED plan. However, since Alternative 8 and Alternative 6 are distinct alternatives and not an optimization of the same measures, the PDT identified Alternative 8 as the NED plan.

Alternative 8 and Alternative 6 both include expanding the bend widener and turning basin. They differ in that Alternative 8 includes creating a vessel meeting area at St. Simons Sound. The proposed meeting area (Alternative 5) has positive net benefits as a standalone alternative and is relatively low cost. The incremental cost of including the St. Simons Sound meeting area is reasonable to gain the additional benefits above those costs associated with two-way harbor traffic. Furthermore, Alternative 8 would also address transportation inefficiencies in three harbor locations versus Alternative 6 which would address transportation inefficiencies in two locations. Alternative 8 creates those additional benefits without the need for any dredging in St. Simons Sound. The incremental average annual benefits from Alternative 6 to Alternative 8 (\$61,000) outweigh the minimal incremental average annual costs (\$36,000) from Alternative 6 to Alternative 8. Alternative 8 is a more complete, effective, efficient, and acceptable plan than Alternative 6. Therefore, it is reasonable to select Alternative 8 as the NED plan.

Regional Economic Development

The RED account measures changes in the distribution of regional economic activity that would result from each alternative plan. Appendix A contains the full evaluation for the NED plan (Alternative 8).

The RED impact analysis for Alternative 8 was evaluated at the local, state, and national levels. In summary, the Civil Works expenditures of \$13,804,000 support a total of 57.3 full-time equivalent jobs, \$3,777,000 in labor income, \$5,535,000 in the gross regional product, and \$10,465,000 in economic output in the local impact area. More broadly, these expenditures support 141.4 full-time equivalent jobs, \$10,129,000 in labor income, \$15,560,000 in the gross regional product, and \$29,625,000 in economic output in the nation.

It is expected that alternatives with a higher construction cost would have a greater impact on regional economic development in terms of full-time equivalent jobs, labor income, gross regional product, and total economic output in the local impact area. Assuming Civil Works expenditures (Project first cost from Table 18) directly creates positive regional economic benefits, Alternative 9 would have the greatest positive impact to regional economic development. This is because Alternative 9 requires approximately \$32 million dollars (FY01) to implement and is the alternative with the largest construction cost. The No Action Alternative would have the least impact on regional economic development since no funding would be expended as no improvements to the harbor would be made. Among the action alternatives, Alternative 5 would have the least impact to the regional economic development of the area since no dredging would be required to implement it. In comparison to Alternative 8 (NED plan), Alternative 2, 3, 5, and 6 would provide less regional economic development benefits due to the lower project cost. Alternative 4, 7, and 9 would provide greater regional benefits than the NED plan due to the increased project cost and associated impacts to the regional economy.

Environmental Quality

The Environmental Quality account considers non-monetary effects on ecological, cultural, and aesthetic resources. Under this account, the environmental effects of the implementation

of the alternatives that include dredging are similar and are not anticipated to have significant environmental impacts. Environmental effects of navigation improvements versus no action are discussed in Section 4.

Other Social Effects

In the Other Social Effects (OSE) category, the most significant benefit would be the improved maneuverability through the bend widener and expanded turning basin and the ability for two-way vessel traffic in the Harbor. All action alternatives would allow for greater maneuverability of RO/RO vessels in the Federal channel. However, Alternative 7, 8, and 9 would provide the greatest benefit in the OSE category by improving vessel maneuverability at three or more locations within the harbor. Alternatives 7, 8, and 9 would widen the Federal channel at two locations and add a vessel meeting area. While the Federal channel has no safety concerns, the addition of a formal meeting area is highly sought after by the Harbor Pilots, in order to provide them greater flexibility as they navigate through the channel. An official meeting area will increase the Harbor Pilots' perception of safety in the area since it would provide a wider channel and additional options for navigating vessels through Brunswick Harbor. Currently, in order to safely pass a vessel in St. Simons Sound the Harbor Pilots must request and receive USCG permission. The USCG will no longer grant permission for vessels to leave the Federal Channel to pass an on-coming vessels. Alternative 2, 3, 4, 5, and 6 would also increase the perception of safety to the channel, but to a lesser extent than Alternative 7, 8, and 9 due to the smaller project footprint.

All action alternatives except for Alternative 5 would result in an increase in dredged material at Andrew's Island DMCA which has the potential to positively impact the economic vitality of the area. Specifically, the Georgia Department of Transportation (GDOT), which operates the DMCA, utilizes the dredged material for road construction projects and sells the material for construction projects at a significantly discounted rate. The GDOT also enters into agreements with other local governments (e.g. City of Brunswick) for dredged material. The GDOT prices the dredged material at a fraction of the cost that other suitable road-grade or construction-grade material would sell for commercially. This availability of low-cost material to the local community is a benefit to the economic vitality of the area. All action alternatives except for Alternative 5 would add dredged material to Andrew's Island DMCA. Alternative 4, 7, and 9 would have a greater impact than Alternative 8 (NED Plan) since more material would be made available for other uses. Alternative 2, 3, and 5 would have less of an impact on economic vitality in comparison to Alternative 8 as less dredged material would be added.

3.10. Selection of the Recommended Plan

This section describes how the plans in the final array of alternatives compare in meeting the planning objectives and constraints, how the alternatives address the four accounts, and identifies key tradeoffs among the alternatives.

All of the final array of alternatives, with the exception of the NAA/FWOP, meet the planning objectives and avoid the known constraints. However, the alternatives have varying degrees of completeness, effectiveness, efficiency, and acceptability. For instance, Alternative 2 would increase transportation efficiency along the Cedar Hammock Range (by increasing the width

of the bend widener), but no additional benefits would be experienced further upstream by the Colonel's Island Terminal. Similarly, Alternative 3 would increase transportation efficiency near Colonel's Island by expanding the turning basin but would not address navigation challenges at the bend widener. Alternatives 4 and 5 would create vessel meeting areas and create overall efficiency improvements but would not address any navigation challenges at the bend widener or turning basin. For these reasons, Alternatives 2 – 5 were screened from consideration as the recommended plan.

Alternative 6 would address the navigation challenges at the Cedar Hammock Range bend widener and the turning basin near Colonel's Island Terminal, but without the added efficiency gains of including a meeting area. Alternative 7 includes a meeting area, but in a location that requires a larger construction cost when compared to Alternative 6, reducing the net benefits. Alternative 8 includes all benefits of Alternative 6, but with the addition of a meeting area in an area of naturally deep water, thus providing a greater net benefit than any other alternative. Alternative 9, which has both meeting area locations, has the highest cost and less net benefit than Alternative 8. Due to implementation costs, Alternative 7 and 9 were screened from consideration as the Recommended Plan.

As discussed in the NED section above, Alternative 6 and Alternative 8 have a similar level of net benefits. Both alternatives include dredging at the bend widener and turning basin; however, Alternative 8 includes the creation of a two-way meeting area at St. Simons Sound that does not require dredging. The incremental congestion relief benefits of Alternative 8 (\$61,000) outweigh the minimal incremental costs (\$35,000) above Alternative 6. Alternative 8 is a more complete, effective, efficient, and acceptable plan than Alternative 6.

In conclusion, Alternative 8 maximizes net benefits consistent with the study purpose, since as a deep-draft navigation feasibility study, the main project purpose is to reduce transportation inefficiencies as measured within the NED account. Alternative 8 also maximizes total benefits across all benefits categories (NED, RED, EQ, and OSE). This is because Alternative 8 is the NED plan, provides positive regional economic benefits, has a similar impact as other alternatives to environmental quality, and solves navigation challenges at three specific harbor locations. Therefore, it is reasonable to select Alternative 8 as the Recommended Plan. The Non-Federal Sponsor supports selection of Alternative 8 as the Recommended Plan and there is no Locally Preferred Plan.

Key Assumptions. This section identifies key assumptions that underlie the analysis. Those assumption include hydrologic, environmental, and economic assumptions key to the formulation and recommendation, including those related to analytic models used in the study.

- Tonnage in Brunswick Harbor will increase according to economic forecasts over the 50 year planning horizon (see Appendix A).
- No environmental mitigation will be required.
- The total volume of dredging for the NED plan (Alternative 8) is approximately 551,000 cubic yards.
- All dredged material is capable of being removed using a hydraulic cutterhead dredge and no blasting is required.

- No dredging (new work or O&M) is required in the proposed meeting area at St. Simons Sound.
- The average shoaling rate for the future turning basin and bend widener is approximately 14,900 cubic yards per year and 2,000 cubic yards per year, respectively.

Risk and Uncertainty

Several risks and approaches to mitigating risks were identified during the evaluation of alternatives. Several risks apply to all alternatives, though in some cases, to varying degrees. For example, a key risk originates from cultural resources surveys occurring during the PED phase. While it is unlikely to find cultural resources in the proposed bend widener area, there is a possibility of finding cultural resources in the turning basin area. In addition, shoreline surveys will be necessary for the widening of the channel near St. Simon's sound. Risk related to cultural resources has been mitigated through coordination with GA HPD and the implementation of a PA to comply with Section 106 of the NHPA (Appendix H). Furthermore, all risks associated with cultural resources are documented in the project's risk register.

At the commencement of the feasibility study, the geotechnical data available was from the 1990s. To better ascertain the site-specific characteristics of sediments to be dredged, and as a condition of the project's GADNR-EPD October 2020 401 Water Quality Certification, sediment samples were collected from the turning basin and bend widener in early November 2020. This sampling confirmed that the use of a cutterhead dredge will be sufficient to dredge in the proposed area (i.e. no blasting will be required). In addition to data about geotechnical characteristics, sediment, surface water, and elutriate samples were analyzed for metals, pesticides, PCBs, PAHs, and dioxins and furans along with grain size and other physical parameters. In general, analyte concentrations were similar to those during the 1997 testing and earlier O&M inner harbor and entrance channel sediment testing in 1992, 1993, and 1995. The full report of sediment results can be found in Appendix L.

Finally, the future tonnage forecast is uncertain and based on the state of the U.S. economy. This risk applies equally to all alternatives and was mitigated by utilizing best available information when making economic forecasts and by performing a sensitivity analysis for low and high commodity growth scenarios.

Overall, the alternatives have similar impacts from various identified risk factors and no alternatives were screened from the analysis due to risk factors.

3.11. Summary of the Recommended Plan

Feasibility-level cost estimates were developed at the FY21 price level the recommended plan (Alternative 8). A detailed "Basis of Cost Estimate" that outlines cost assumptions appears in the Cost Appendix (Appendix C). Potential risk events were evaluated and incorporated into a risk model to determine appropriate contingency levels. Costs of the recommended plan were further refined during cost certification and are reflected below.

Table 25 summarizes the certified cost information for the Recommended Plan which were used in the final economic evaluation. Construction costs were revised to \$13,804,000. Interest during construction was computed on the construction first cost using a 12-month construction duration and the current discount rate of 2.5 percent. There were no service facility costs to capture the widening benefits. The addition of aids-to-navigation was included. Aids to navigation include the addition of 3 buoys to the Brunswick Harbor Federal Navigation Channel. Two buoys will be required for the expansion of the Federal channel at St. Simon's sound and would be placed on the northern edge of the channel. Currently, the bend widener in the Cedar Hammock Range has one buoy marking the channel location. With the expansion of the bend widener a second buoy will be required along with moving the current buoy. The USCG provided costs related to the aids to the navigation (Keefauver, R. Personal communication, 2020). The total investment cost is the sum of the construction first cost, interest during construction, and aids-to-navigation

Table 25. NED Economic Costs (FY21 prices)

Cost	NED Plan
<i>Construction First Cost</i>	\$13,804,000
<i>IDC (12 months @ 2.5%)</i>	\$345,100
<i>Aids to Navigation</i>	\$110,426
<i>Total Investment Cost</i>	\$14,259,526
<i>AAEQ Cost</i>	\$487,000
<i>AAEQ OMRR&R</i>	\$150,000
<i>Total AAEQ Cost</i>	\$637,000
<i>Note: Transportation costs are based on FY17 vessel operating costs updated from EGM 17-04.</i>	

Net Benefits and Benefit-Cost Ratio (BCR)

Table 26 displays the updated costs, benefits, and net benefits for the Recommended Plan at the FY21 price level and 2.5 percent discount rate. The Recommended Plan maximizes net benefits at \$2,306,000 and at a BCR of 4.6.

Table 26. Summary of Recommended Plan (FY21 prices)

Alternative	Total AAEQ Benefits¹	Total AAEQ Costs	Total Net Benefits	Incremental Net Benefits	Benefit/Cost Ratio (BCR)
Alternative 8	\$2,943,000	\$637,000	\$2,306,000	--	4.6
Transportation cost savings benefits are based on FY17 vessel operating costs updated from EGM 17- 04.					

Table 27 provides a summary of the costs and benefits of the Recommended Plan. O&M dredging expenses have been estimated to occur every year at \$150,000 per dredge cycle at the FY21 price level. AAEQ cost is estimated at \$637,000, which includes an AAEQ cost for O&M of \$150,000. AAEQ benefits include origin-to-destination transportation cost savings of approximately \$2,943,000, resulting in total net benefits of \$2,306,000 (AAEQ benefits minus

AAEQ costs) and a 4.6 BCR. First costs for authorization are estimated at \$13,804,000 (FY21 price level).

Table 27. Average Annual Equivalent (AAEQ) Benefits and Costs of the Brunswick Harbor NED Plan

	Cost and Benefit Summary of the NED Plan (FY 21 price level)
Interest Rate (Fiscal Year 2020)	2.5%
Construction Period, Months	12
Period of Analysis, Years	50
Construction First Costs	\$13,804,000
Interest During Construction (First Costs only)	\$345,100
Estimated Local Service Facilities	\$0
Estimated Aids to Navigation	\$110,426
<i>Estimated Economic Costs (FY 21 price level)</i>	<i>\$14,259,526</i>
AAEQ Costs	
Amortized Cost	\$487,000
OMRR&R	\$150,000
<i>Total AAEQ Costs</i>	<i>\$637,000</i>
AAEQ Benefits	
Origin-to-Destination Transportation Cost Savings ¹	\$2,943,000
<i>Total AAEQ Benefits</i>	<i>\$2,943,000</i>
AAEQ Net Benefits (AAEQ Benefits – AAEQ Costs)	<i>\$2,306,000</i>
Benefit-to-Cost Ratio (computed at 2.5%)	4.6
¹ Transportation costs and cost savings benefits are based on FY17 vessel operating costs updated from EGM 17-04.	

4. Environmental Consequences of Alternatives

Section 4.0 examines and describes the direct and indirect physical effects and potential impacts of implementing the final array of alternatives on the resources described in Section 2.0. The final array of alternatives consists of 9 alternatives, which are described in Section 3.8. The analysis of environmental impacts for this proposed project involves the discussion of each stand-alone alternative as well as a combination of alternatives. For the purposes of this analysis, the currently authorized Brunswick Harbor design is the No Action Alternative (NAA). The NAA or Future Without Project is described in Section 3.8.

The analysis of environmental effects includes actions both during the construction phase and for maintenance dredging after construction has been completed. Common to all action alternatives is the continued O&M of the navigation channel, incorporating the 2020 SARBO. A full description of the O&M action alternative is described in Section 3.8. The environmental consequences analysis for the O&M action alternative focuses on the changes to O&M dredging in comparison to the NAA.

4.1. Hydrology and Floodplains

No Action/FWOP

Under the NAA, O&M dredging to maintain the currently authorized depth of the Federal navigation channel would continue. The 1998 EIS indicated no effects to water velocities, water levels, or flow direction from the current authorized and maintained depth of the navigation channel. Hydrodynamic modelling conducted for the 1998 EIS indicated no effect to currents from the current configuration of the navigation channel. As O&M dredging maintains the depths as evaluated in the 1998 EIS, no impacts to hydrology are anticipated under the NAA. Dredged material is placed in established disposal sites and no impacts to floodplains are anticipated under the NAA.

Alternatives 2 through 9

With implementation of the Alternatives 2 through 9, no changes in hydrology and floodplains are anticipated.

Alternative 5 would not result in any physical modifications of the channel, and therefore would not have any impacts to hydrology. No additional O&M dredging would be needed under Alternative 5 and no impacts to floodplains would occur.

The proposed channel modifications were measured in a 2D Adaptive Hydraulic modeling system (AdH) and no increase in water levels throughout the channel were observed. Therefore, based on modelling the proposed channel modifications are not anticipated to change water levels from the existing water level and the proposed channel modifications in Alternatives 2,3,4,6,7,8 and 9 would not impact hydrology. Placement of dredged material from the new work would occur at Andrews Island

DMCA, an established dredged material containment area, and impacts to floodplains are not anticipated.

O&M Dredging Action Alternative

The anticipated O&M average annual quantities dredged for Brunswick Harbor for Alternatives 2, 3, 4, 6, 7, 8 & 9 would increase from approximately 390,000 yards to approximately 406,900 cubic yards. Additional O&M dredging related to the proposed changes is a nominal amount (16,900 CY) and would not require changes to current maintenance activities. Full utilization of the 2020 SARBO may change the timing of when dredging may occur in the entrance channel but would not result in any modifications of the dredge prism, or changes in activities related to placement of dredged material. Therefore, the continued O&M dredging as described in the action alternative is not expected to significantly affect hydrology and floodplains. The effects to hydrology and floodplains from O&M dredging would be the same as described under the NAA.

4.2. Aquatic Resources, Habitat and Substrate

No Action Alternative

All O&M dredging activities will utilize the capability of cutterhead, clamshell, and hopper dredges for the removal of maintenance material. The existing O&M average annual quantities dredged for Brunswick Harbor is approximately 1,609,000 cubic yards. This amount includes 390,000 cubic yards in the inner harbor reach and 1,219,000 cubic yards in the entrance channel/outer harbor. For macrobenthic invertebrate species in the study area, removal of substrate during dredging eliminates most benthic resources in those locations. Those sites would be available for recolonization and use by benthic organisms once the dredging event ceases, so no irreversible loss of resources would occur. Benthic populations in the navigation channel are in a constant state of flux due to the continual sedimentation and shoaling that creates the need for maintenance dredging (SHEP-EIS, 2012). Early successional benthic organisms will likely rapidly colonize the dredged footprint (Van Dolah et al., 1984). As described in the 1998 EIS, Corps' studies in the Mississippi Sound and at Apalachicola Bay, Florida showed that the effects of maintenance dredging on the plankton systems were negligible and that natural phenomena such as tidal flushing, rainfall, temperature and salinity gradients appear to have more influence in determining the dynamics of the plankton community. The studies showed that the benthic communities of those estuarine systems have adapted to natural stresses that are similar to those caused by dredging. Therefore, no significant or long-term changes in community structure or function are expected.

For diadromous fish such as striped bass and blueback herring, although these fish species are present through various life stages and actively use the entire water column within the study area for both traveling upstream and downstream and feeding, minimal impacts are anticipated since most of the fish species present have the ability to freely avoid any dredge activity. In addition, feeding during any dredge activity will likely

temporarily decrease in the study area due to a temporary loss of macrobenthic invertebrates, as well as a reduced ability for fish feeding via sight due to the temporary increase of turbidity in the water column. However, no significant impacts are expected to occur on sight feeders, as noted above most of the fish species present have the ability to avoid any dredge activity associated with maintenance dredging.

Alternative 5

With the implementation of Alternative 5, there will be no changes to aquatic resources or habitat in the study area. Alternative 5 would create a RO/RO vessel meeting area located at St. Simons Sound near the entrance channel to Brunswick Harbor. Since this area is naturally deep water (deeper than -38 feet MLLW), no dredging would be required. This would not require any physical work in the channel, and the existing navigational channel centerline would not change. Under Alternative 5, aquatic resources and aquatic habitat will remain the same. No impacts to aquatic resources and aquatic habitat are anticipated beyond normally scheduled annual maintenance dredging. This Alternative, as with the No Action Alternative, assumes O&M dredging would occur within the Federal navigation channel at authorized depths (-36 feet MLLW + 2 feet allowable over-depth) as normally scheduled on an annual basis. Andrews Island DMCA will remain as the primary location for the dredged material storage. Impacts from maintenance dredging would be the same as described under the NAA.

Alternatives 2, 3, 4, 6, 7, 8, & 9

Alternatives 2, 3, 4 are considered stand-alone alternatives while 6, 7, 8 and 9 are combinations of the above stated “stand-alone” alternatives.

The proposed new work dredging will be accomplished through the exclusive use of a cutterhead dredge. The new dredging (cutterhead) portion of the project is anticipated to commence on November 1, 2024 (pending congressional authorization and funding availability) and continue for approximately 12 months. Upon construction completion, the Corps will continue to conduct its long-term O&M of Brunswick Harbor once these areas are incorporated into the Federal Navigation Channel.

Alternatives 2, 3, 4, 6, 7, 8 & 9 all require the removal of material for the proposed channel modifications. Dredged quantities for each action alternative are represented in Table 28.

Table 28. Proposed Dredged Quantities for Each Action Alternative

Alternative	Quantities Dredged (yd³)
Alt 2. Bend Widener	205,159
Alt 3. Turning Basin expansion	346,462
Alt 4. West of Sidney Lanier Bridge	800,074
Alt 5. St Simons Sound	-
Alt 6. Bend Widener + Turning Basin	551,621
Alt 7. Bend Widener + Turning Basin + Area West of Bridge	1,351,695
Alt 8. Bend Widener + Turning Basin + St. Simons Sound	551,621
Alt 9. Bend Widener + Turning Basin + Area West of Bridge + St. Simons Sound	1,351,695

For macrobenthic invertebrate species in the study area, removal of the bottom substrate within the dredging areas would eliminate most benthic resources in those locations. Those sites would be available for recolonization and use by benthic organisms once the dredging event ceases, so no irreversible loss of resources would occur. Early successional benthic organisms will likely rapidly colonize the dredged footprint (Van Dolah et al., 1984). However, the dredged footprint may be comprised of different benthic communities due to the alteration in depth, from shallow to deeper waters (NMFS, 2020). Surviving populations of fish and macroinvertebrates specifically adapted to the shallower habitat will in addition relocate to abundant similar habitat just outside the project scope that will remain preserved. The proposed dredging will not limit the density and diversity of the benthic community that becomes reestablished any more so than existing maintenance activities. Since benthic populations in the navigation channel are also in a constant state of flux due to the continual sedimentation and shoaling that creates the need for maintenance dredging (SHEP-EIS, 2012), the cumulative effects on phytoplankton and zooplankton species living in the water column should not be affected any more so than the existing maintenance activities.

For diadromous fish such as striped bass, and blueback herring, although these fish species are present through various life stages and actively use the entire water column within the study area for both traveling upstream and downstream and feeding, minimal impacts are anticipated since most of the fish species present have the ability to freely avoid any dredge activity. In addition, feeding during any dredge activity will likely temporarily decrease in the study area due to a temporary loss of macrobenthic invertebrates, as well as a reduced ability for fish feeding via sight due to the temporary increase of turbidity in the water column. No significant impacts are expected to occur on sight feeders.

O&M Dredging Action Alternative

The anticipated O&M average annual quantities dredged for Brunswick Harbor for Alternatives 2, 3, 4, 6, 7, 8 & 9 would increase from approximately 390,000 yards to approximately 406,900 cubic yards. It is anticipated that there would be no change to the inner and outer harbor shoaling rates from any of the action alternatives. The nominal amount of maintenance material resulting from the new work would not result in any changes to dredging activities and would have no effect.

Continued O&M would fully utilize the minimization measures in the 2020 SARBO. As noted in Section 3.8, this would result in using the risk-based management approach to determine the best time of year to accomplish dredging, including the possible use of hopper dredging during the warmer months in the entrance channel. All other dredging activities would also utilize the risk-based approach but are expected to be similar to the NAA, with minor improvements to the design of equipment used. Improvements to the design of equipment used could provide minor beneficial impacts to other fish and

macroinvertebrate aquatic species, as these improvements are designed to reduce entrainment and harm to fish and sea turtles. If dredging occurred during the warmer months, benthic species may experience minor adverse effects as primary production is higher in the warmer months. These impacts are expected primarily in the entrance channel. However, as noted above in NAA impacts analysis, there is abundant available habitat adjacent to the entrance channel and any adverse effects would not be significant. Impacts from O&M dredging would be similar to those described under the NAA, and overall, there would be no significant impacts to aquatic resources and habitat.

Regarding invasive species, the alternatives being evaluated as part of this study, including continued O&M, are not expected to cause an increase or decrease in proliferation or recruitment for these species. Therefore, there are no impacts related to invasive species.

4.3. Essential Fish Habitat

No Action

With implementation of the NAA, EFH will not be adversely affected as no changes are proposed. The existing O&M average annual quantities dredged for Brunswick Harbor is approximately 1,609,000 cubic yards. This amount includes 390,000 cubic yards in the inner harbor reach and 1,219,000 cubic yards in the entrance channel/outer harbor. O&M dredging activities will use cutterhead, clamshell, and hopper dredges for the removal of maintenance material. All dredged material would be placed in established ODMDs or Andrews Island DMCA. As described under Section 4.2, benthic populations in the navigation channel are in a constant state of flux due to the continual sedimentation and shoaling, these communities are adapted to natural stresses that are similar to those caused by maintenance dredging. Additionally, given the abundant habitat adjacent to the navigation channel, impacts from maintenance dredging on EFH are negligible.

Alternative 5

With implementation of the Alternative 5, Coastal Inlet EFH will remain the same. No impacts to Coastal Inlet EFH are anticipated beyond normally scheduled annual maintenance dredging. This Alternative, as with the No Action Alternative, assumes O&M dredging would occur within the Federal navigation channel at authorized depths (-36 feet MLLW + 2 feet allowable over-depth) as normally scheduled on an annual basis to continue to accommodate commercial vessel navigation.

Alternatives 2, 3, 4, 6, 7, 8 & 9

With the implementation of Alternatives 2, 6, 7, 8, and 9, material would be placed in the Andrews Island DMCA. Alternatives 2, 3, 4, 6, 7, 8, and 9 are comprised of both stand-alone proposals and in various combinations. The impacts from dredge activity for these alternatives on EFH are discussed below.

Coastal Inlets, Tidal creeks, and unconsolidated bottom - With the implementation of Alternatives 2, 4, 6, 7, 8, and 9, all alternatives involve impacts to EFH through dredging

the bend widener, be it as a stand-alone alternative or as part of a combination of alternatives. The substrata in the area proposed for dredging is of similar composition as the adjacent Federally-maintained channel. The bend widener dredging activity would require removal of material in deep, open-water habitat and, given the abundance of nearby habitats for organisms to recruit from, will likely recovery quickly (NMFS 2020). Any loss of habitat would be short-term, and through primary and secondary succession, would not adversely affect the reestablishment of the existing benthic communities or alter the capacity of EFH to support healthy populations of managed species over the long-term. Early successional benthic organisms will likely rapidly colonize the dredged footprint (Van Dolah et al., 1984).

Alternatives 3 and 6-9 include dredging at the turning basin expansion and Alternatives 4, 7 and 9 include dredging at the meeting area west of the Sidney Lanier Bridge will result in converting some shallow sub-tidal habitat to open-water habitat and, the dredged footprint may be comprised of different benthic communities due to the alteration in depth, from shallow to deeper waters (NMFS 2020). Surviving populations of fish and macroinvertebrates specifically adapted to the shallower habitat will relocate to abundant similar habitat just outside the dredging footprint. The conversion of one EFH type to another does not eliminate, diminish, or appreciably disrupt EFH in the study area as the footprint is minimal compared to the availability of similar and immediately adjacent EFH. Therefore, the temporary and minimal impacts associated with the proposed dredging activities will not reduce the quality or quantity of EFH within the study area, and no adverse effects are expected to EFH from these alternatives. Additionally, NMFS offers no EFH conservation recommendations for the proposed Brunswick Harbor Modifications (NMFS 2020).

O&M Dredging Action Alternative

The anticipated O&M average annual quantities dredged for Brunswick Harbor for Alternatives 2, 3, 4, 6, 7, 8 & 9 would increase from approximately 390,000 yards to approximately 406,900 cubic yards. It is anticipated that there would be no change to the inner and outer harbor shoaling rates from any of the action alternatives. The increase of 16,900 CY of material is nominal compared to annual maintenance amounts, this increase in material would not result in any changes to maintenance dredging activities. All material would be placed in established placement sites.

Continued O&M would fully utilize the minimization measures in the 2020 SARBO. As noted in Section 3.8, this would result in using the risk-based management approach to determine the best time of year to accomplish dredging, including the possible use of hopper dredging during the warmer months in the entrance channel. All other dredging activities would remain essentially the same as the NAA. Benthic species may experience minor adverse effects as primary production is higher in the warmer months, these impacts are expected primarily in the entrance channel. However, as noted above in NAA impacts analysis, there is abundant available habitat adjacent to the entrance channel and the footprint of the navigation channel is minimal compared to available habitat. Impacts from O&M dredging would be similar to those described under the

NAA, and overall, there would be no significant impacts to EFH.

4.4. Wetlands

No Action, Action Alternatives 2 through 9, and O&M

No direct or indirect effects to wetlands are anticipated under any of the alternatives, including O&M NAA and action alternative. As indicated under section 4.1, the NAA and action alternatives would not impact water levels or velocities, therefore indirect impacts to wetlands from channel modifications are not anticipated. Continued O&M as it would maintain the channel dimensions would also not result in indirect impacts to wetland from in-water work. All new work and O&M dredged material would be placed in established regulated disposal sites and placement of dredged material would not result in any loss of wetlands. Sufficient capacity in the Andrews Island DMCA and ODMS for material produced from both new work and continued O&M exists. Establishment of new placement sites is not needed. Overall, there would be no effect to wetlands from any of the alternatives or from continued O&M, as described in Section 3.8. Additional information regarding wetland impacts can be found in Appendix L.

4.5. Protected Species

No Action Alternative

Under the NAA, the Corps would not perform the new work modifications to the channel. In addition, O&M of Brunswick Harbor existing channels would be accomplished in a manner consistent with the 1997 SARBO including limiting hopper dredging to the historic environmental window of December 1- April 15 and limiting bed-leveling to only the Brunswick Harbor design.

Since the 2020 SARBO replaced the 1997 SARBO, O&M dredging must adhere to the conditions of the 2020 SARBO to be compliant with SARBO and the ESA. While the 2020 SARBO allows dredging at any time of year, including the historic winter environmental windows, it also requires that a project meet all relevant project design criteria and that the dredging equipment, timing, and minimization measures be evaluated under the umbrella of risk-based adaptive project management, as outlined in the 2020 SARBO Section 2.9.2. This risk-based assessment process is an internal deliberative process to evaluate risk associated with a specific project (e.g., this Brunswick study and future O&M) as well as the cumulative effects of all projects covered under the 2020 SARBO. It is not a one-time decision and may result in different recommendations year after year. It requires critical thinking and an understanding of the species and habitat in the area and the site-specific conditions that could affect the success of the project. Information (new data, publications, etc.) for this assessment is gathered from available documentation, regular coordination with NMFS and BOEM, and coordination with resource managers, academia, dredging contractors, surveyors, and others. It also considers project-specific knowledge and lessons learned from prior O&M at the project site as well as from other similar past projects.

Regardless of the decisions made, all projects covered under the 2020 SARBO are limited by the regional species-specific take limit provided in the 2020 SARBO. USACE has a long history of adaptive project management to assure that no project results in excessive take of any species or a combination of species, which includes closely tracking all projects, adjusting project components, adding species take minimization measures, and even stopping projects deemed to be too high risk to continue. These decisions are based on past experience and determination is different for every project based on a project-specific and regional considerations such as the total project and regional take for a specific species that fiscal year, the frequency of take, factors that may be leading to the take and if they can be minimized, the need to continue dredging to meet navigational requirements, and other logistical and economic factors discussed in this document.

Two key risks identified with continuing to limit dredging to historic winter environmental windows include the risks to Atlantic sturgeon from entrainment by hopper dredging and the risk of vessel strike to North Atlantic right whales from any equipment associated with the project that is over 33-ft in length and transiting coastal waters during NARW calving season. The coastal areas of the study area, including the entrance channel, ODMDS, and areas transited between them are used for calving by NARW from December to March each year. As discussed in the affected environment, this critically endangered species has seen a loss of 10% of the population in the last several years and calving rates have been low with no calves born in 2018. Therefore, the risk-assessment under the 2020 SARBO considers the consequences of a potential vessel strike to a NARW mother and/or calf from all vessels associated with the project. Prioritizing working outside of calving season is a requirement of the North Atlantic Right Whale Conservation Plan in the 2020 SARBO as well as continued funding by USACE to provide aerial surveys to identify the presence of this species from North Carolina to Florida. Under the NAA, this requirement would not be met.

Without the ability to move dredging outside of the winter and NARW calving season, some options for reducing risk to NARW would be to reduce the number of vessels that may transit to the ODMDS, the number of vessels associated with the project and the speed of vessels over 33 feet in length. Even with one or more of these minimization measures, the risk to NARW would be greater than if the O&M dredging was done outside of the calving season as vessel traffic would be increased. Additional options are to use cutterhead dredge, place material on shore or use clam shell dredging. These last options, while they were considered, were determined to be either too costly to be able to do the routine O&M or incongruent with the least cost placement required by federal regulations. The risk to NARW from vessel traffic was not fully understood at the time of the 1997 SARBO and on October 10, 2008 the final rule to implement speed restrictions for vessels 65 feet in length or greater was published in the Federal Register. In addition, the NOAA Fisheries website indicates that because vessels of all sizes can strike a whale, they encourage vessels less than 65 feet in length to slow to 10 knots or less within seasonal management areas (e.g. the calving area off of the south Georgia/north Florida coast). The Corps is not subject to this rule while completing dredging and material placement. The NARW Conservation plan provides

when and where specific speed restrictions will be enacted for vessels working on projects covered under 2020 SARBO. Therefore, the added protective measures under the 2020 SARBO would not be applied under the NAA.

As noted in Section 3.1.4.1.4 of the 2020 SARBO: “We [NMFS] believe that the risk of a vessel strike occurring during a project analyzed under this Opinion is very low,[1] since we are only aware of 2 reported interactions with vessels related to dredging, worldwide with North Atlantic or the closely related South Atlantic right whales despite decades of dredging both within the action area and globally. ***However, the consequences of potential take of a North Atlantic right whale to the small population of the species is high.*** While we do not normally discuss the status of a species when evaluating effects to a species if the effects from the action are not likely to adversely affect the species, the risk of vessel strikes and potential outcome of a strike to a North Atlantic right whale is unique due to the critical status of the population of this species. Key factors that affect the status of this species include an already low population size that is declining, a decline in the number of calves born annually with none born during the 2017-2018 calving season, an increasing number of years between calving cycles for reproductive females, and evidence of declined health of the reproductive females of this species. Additionally, the action area for this Opinion also includes the only calving grounds for North Atlantic right whales, meaning that smaller calves may be present. Due to their smaller size, calves are at an increased risk of mortality from vessel strikes.” The risk of a vessel strike from dredging equipment working in the historic dredging windows under the NAA, is low, especially with implementation of the NARW conservation measures in SARBO Appendix F. However, the consequence of a strike is high in that it could change the trajectory of the survivability of a species with such low population numbers. Furthermore, the hopper dredging window coincides with NARW calving season and dredging during this window increases the risk of strike. In addition, the 2020 SARBO does not include take for this species.

For Atlantic sturgeon, prior O&M at Brunswick and nearby channels during historic winter environmental windows has resulted in lethal take of Atlantic sturgeon including six in 2017 (hopper dredging December 30, 2017 to March 30, 2017) and four in 2020 (hopper dredging from January 10 to February 20, 2020) in Brunswick. The mortality risk for Atlantic sturgeon has been reduced by performing relocation trawling (which has been accomplished under the 1997 SARBO but is not specifically authorized). Relocation trawling in Feb/March of 2018 when Brunswick Harbor was dredged during the environmental windows, resulted in 80 Atlantic sturgeon relocations. While minimal mortality was associated with this effort, it is still stressful to the sturgeon and may result in decreased ability to weather other stresses. In general, the number of sturgeon in the entrance channel is much larger in the winter than it is during the summer. The current theory is that the sturgeon are staging in these areas to go up nearby spawning rivers in the spring. In addition, sturgeon are a benthic species generally found on the sea floor, which can reduce the effectiveness of capture by relocation trawling.

One method to reduce risk of species entrainment from hopper dredging (e.g. sea turtles and sturgeon) is to utilize bed levelers. Bed-leveling is used near the end of

hopper dredging projects to reduce the time a hopper dredge is needed to remove remaining sediment. The bed-leveler is used to smooth out the hills and valleys created by hopper dredging. Take of species tends to be the highest during this time since it is more difficult for the hopper dredge draghead to stay embedded in the uneven remaining sediment and species in the area including those resting in the valleys can be entrained.

Studies were done in Brunswick Harbor, Georgia, to test if bed-leveling harmed sea turtles or sturgeon (see 2020 SARBO Section 3.1.1.6.4). Brunswick was chosen for this study based on the density of sea turtles in the area and the concern of sea turtle brumation (hibernating on the sea floor during cold weather events) leading to their being injured by bed-leveling. During the trials, trawling directly behind the bed-leveler captured and released 38 live sea turtles and two Atlantic sturgeon with no mortalities, thus demonstrating that sea turtles and sturgeon were present during the bed-leveling operations and unharmed by the process (Dodd 2003). USACE believes this process is effective at protecting all mobile species without harm. Only the Brunswick Harbor design of bed leveler would be used for the NAA, to be consistent with what has been done in the past. There are limited numbers of these and thus one may not be available to use. This could mean that the hopper would be used for clean up which would increase risk to turtles, sturgeon, and NARW.

The 1997 SARBO was a turtle-centric approach that considered the best way to protect sea turtles was to limit work to winter months when sea turtle abundance throughout the SARBO action area was lower. However, the 2020 SARBO updates NMFS approach to protection of ESA-listed species from dredging and material placement from a strict seasonal window to protect sea turtles to an evaluation of risk to all species in the action area under an evolving understanding of risk to species through continued coordination with NMFS and BOEM. The risk to sea turtles from working outside of historic winter environmental windows was considered by NMFS in their analysis for the 2020 SARBO and regional take limits are provided that do not result in jeopardy to the species.

Sea turtle brumation on or in the surface layer of bottom sediments is more likely in the winter, thus the use of turtle deflectors becomes even more important during the winter, with relocation trawling being a less effective minimization measure.

The take limit for loggerhead sea turtles in the 1997 SARBO was 35 per year for the entire region; however the most taken in a single year was 18 with an average of 9 observed loggerhead lethal take per year for all projects in four states combined covered under the 1997 SARBO.

Overall, the NAA constrains the minimization measures that can be utilized and the NAA has greater risk to the critically endangered NARW and Atlantic sturgeon in the action area than implementation of the 2020 SARBO.

Alternatives 2 through 9

With implementation of any of the action alternatives being evaluated, the Corps has concluded that the proposed actions may affect but are not likely to adversely affect some and have no effect to other Federally listed species under NMFS and USFWS jurisdiction.

The Corps ESA-listed species determination for marine life under the NMFS jurisdiction is specifically for the new work dredging proposed by the BHMS. The new work being proposed would be exclusively conducted using cutterhead dredging. All proposed activities are designed and will be implemented in compliance with the PDCs in Appendix B of the 2020 SARBO.

Pursuant to section 7 of the ESA, the National Marine Fisheries Service issued a Letter of Concurrence, dated May 24, 2021, that determined that the modification (new work) may affect, but is not likely to adversely affect ESA-listed species. It also considered that future maintenance dredging and dredged material placement may then be covered under 2020 SARBO. This consultation accordingly evaluates those portions and effects of the project not analyzed in 2020 SARBO and incorporates the 2020 SARBO by reference for analysis of effects to ESA-listed species and designated critical habitat resulting from future maintenance of the modified channel in Brunswick Harbor. The Letter of Concurrence evaluated effects to sea turtles (Kemp's Ridley, green, hawksbill, leatherback, and loggerhead), sturgeon (shortnose and Atlantic), and Giant manta ray. A no effect determination was made for all other species with the potential to occur in the action area of the new work dredging (recommended plan). There is no designated critical habitat in the project location. All project design criteria (from the 2020 SARBO), terms and conditions, conservation measures, and reasonable and prudent alternatives and measures resulting from these consultations shall be implemented in order to minimize take of endangered species and avoid jeopardizing the species.

For North Atlantic right whales (*Eubalaena glacialis*), the project action area for the new work is limited to areas in the South Brunswick River, Turtle River, and St. Simons Sound, where North Atlantic right whales that inhabit coastal ocean habitat would not occur. The proposed project will not increase cargo vessel traffic, and therefore, the project action area does not include shipping lanes or the Federal navigation project extending offshore in the Atlantic Ocean. As a result, the proposed new work will have no effect on North Atlantic right whales.

The Corps has made a no effect determination for all other listed species under the purview of the NMFS and described in Appendix I. There is no designated critical habitat within the project location.

The Corps has consulted with the USFWS on our may affect, not likely to adversely affect determination for the West Indian manatee (*Trichechus manatus*) and a no effect determination for the Wood stork (*Mycteria Americana*), piping plover (*Charadrius melodus*), red knot (*Calidris canutus*) and Eastern black rail (*Laterallus jamaicensis jamaicensis*), as well as other species under their jurisdiction. Additionally, the Corps has coordinated with USFWS as required by the FWCA. On May 20, 2020, USFWS provided the Corps with a FWCA evaluation (Appendix K). The evaluation addresses species that under USFWS jurisdiction, including ESA-listed species and

migratory birds and shorebirds. For ESA-listed species, the USFWS concurred with the effects determinations in a letter received June 20, 2020 and by email received on January 25, 2021. USFWS concluded that the none of the proposed action alternatives are expected to significantly impact fish and wildlife resources under their jurisdiction (see Appendix K). The following paragraphs provide a summary of basis of the effects determination.

Piping plovers, red knot, and Eastern black rail do not nest in the proposed study area, and the area does not possess their preferred feeding or resting habitats.

For all dredging activities under any of the action alternatives, the Corps would include requirements in the dredging contracts for the protection of manatees. These provisions are:

- In the event of an encounter from a manatee, contractors will observe best management practices (BMPs) and will remain informed of the civil and criminal penalties for harming, harassing or killing of manatees protected under the ESA and in some cases, the MMPA as well. The contractor(s) may be held responsible for any marine mammals harmed, harassed or killed as a result of construction activities. Therefore, the proposed project may affect but is not likely to adversely affect the manatee.

The Corps will follow all applicable PDC in the 2020 SARBO for the proposed new work dredging as well as. Design criteria applicable to the project includes:

Conservation Measures and Best Management Practices:

- In order to minimize impacts to threatened and endangered (T&E) species and marine mammals, all relevant Project Design Criteria (PDC) from the 2020 SARBO will be incorporated in the new work.
- Apparent cold-stunned sea turtles and/or distressed marine mammals will be immediately reported to the Georgia Sea Turtle Stranding and Salvage Network (1-800-2-SAVE Me or 912-280-6892) or the Georgia Marine Mammal Stranding Hotline (912-269-7587), respectively.
- All personnel shall report giant manta ray sightings to the giant manta ray recovery coordinator at NMFS Southeast Region Protected Resources Division (manta.ray@noaa.gov). Giant manta ray's observations should be photographed and include the latitude/longitude, date, and environmental conditions at the time of the sighting.
- All personnel shall follow observation and reporting observation guidelines of ESA-listed species found in Appendix H in 2020 SARBO. The BHMS new work dredging proposes to use the cutterhead dredge method, minimizing turbidity by piping away the sediments without having to bring material up through the water column in a bucket or transport them to an offshore location by way of scow.
- Cutterhead dredging shall be monitored for take of sturgeon in accordance with the guidelines outlined in the 2020 SARBO.
- In-water lines (rope, chain and cable), if used, shall be stiff, taut and non-looping. Flexible in-water lines, such as nylon rope or any lines that could loop or

tangle, shall be enclosed in a plastic or rubber sleeve/tube to add rigidity and to prevent the line from looping or tangling. No excess line is allowed in the water. All lines or cables shall be monitored regularly to ensure nothing has become entangled and then immediately removed upon project completion. Cables or lines with loops used to move pipelines, or buoys shall not be left in the water unattended.

O&M Dredging Action Alternative

Common to all action alternatives, the Corps will continue to conduct long term O&M of Brunswick Harbor and, once constructed, incorporate the new work areas into the Federal Navigation Channel. Any subsequent O&M dredging would occur annually, as needed, based on shoaling rates, and follow all pertinent project design criteria (PDCs) in the 2020 SARBO. All routes of effect for O&M for ESA listed species have been thoroughly analyzed in the 2020 SARBO and additional detail about each of the 25 species and seven critical habitats considered in the 2020 consultation can be found in the 2020 SARBO (https://media.fisheries.noaa.gov/dam-migration/sarbo_acoustic_revision_6-2020-opinion_final.pdf).

As discussed in the NAA section above, all projects covered under the 2020 SARBO (including Brunswick) must adhere to all applicable PDCs. Project timing, equipment use, and minimization measures are considered using the risk-assessment process. The risk-assessment considerations for NARW and Atlantic sturgeon were discussed in the NAA - presence of the species in the study area during certain times of year. Moving work outside of historic winter environmental windows significantly reduces the risk to both species. It may slightly increase risk to sea turtles as more sea turtles may be in the area in the spring, summer or fall because sea turtles are more abundant in the study area during warmer months. However, sea turtles thermoregulate so while those encountered during winter months are less able to avoid interactions with equipment, those encountered during warmer months are able to react quicker. In addition, sea turtles are believed to move more throughout the water column in warmer months reducing the time they rest on the bottom and would interact with a dredging equipment. Hopper dredging has been successfully done in other areas when sea turtle abundance was high and did not result in sea turtle take by hopper dredging or take was not higher than timeframes when turtle abundance was low. The 2020 SARBO offers the flexibility to continue to adjust project timing, equipment options, and minimization measures covered under SARBO to adjust projects to continue to try to reduce risk to all species based on an increased understanding of species and risk year after year. Continued research increases the understanding of species use of areas and risk from projects and how these continue to change based on factors such as extreme weather events like hurricanes and climate change.

As discussed previously in the NAA, relocation trawling can also be utilized as a minimization measure. This effort can relocate both sturgeon (primarily in the winter months) or sea turtles (year-round). One concern considered in the 2020 SARBO is the potential harm that may occur to gravid sea turtles if relocated in the summer during nesting season. This risk will be taken into consideration before relocation trawling is

utilized in the summer and relocation trawling, when employed, is closely monitored. The non-lethal take limit for loggerhead sea turtles (which applies primarily to relocation trawling) is 5,270 over a three-year period. In addition, the 2020 SARBO considered the risk of lethal take to gravid sea turtles and loss of egg clutches from relocation for Brunswick and other areas that may use relocation trawling in the summer and calculated an assumed lethal take that would be unobservable. By contrast, the non-lethal take limit for Atlantic sturgeon across three distinct population segments (DPS) is 126 over a three-year period. NOAA Fisheries (NMFS) concluded in the 2020 SARBO that even if significantly more loggerhead sea turtles are relocated than in the past and even if some lethal take occurred from relocating gravid sea turtles, it would not be expected to jeopardize the species.

One method to reduce risk of species entrainment from hopper dredging (e.g. sea turtles and sturgeon) is to utilize bed levelers. Bed-leveling is used near the end of hopper dredging projects to reduce the time a hopper dredge is needed to remove remaining sediment. The bed-lever is used to smooth out the hills and valleys created by hopper dredging. Take of species tends to be the highest during this time since it is more difficult for the hopper dredge draghead to stay embedded in the uneven remaining sediment and species in the area including those resting in the valleys can be entrained. Appendix B of the 2020 SARBO include specific PDCs for design specifications for bed levelers that reduce the impacts to listed species, including the avoidance of pinch points where species can be trapped. Bed leveling decreases risk to sea turtles and sturgeon during the project clean up phase, when most of the material has been removed and the smoothing of the ridges and valleys occurs. If a hopper dredge is used during this phase the ridges and valleys make it difficult to keep the draghead deflector buried in the sediment and more likely that a species on the bottom (e.g., a sturgeon or a sea turtle) may become entrained.

As discussed in the affected environment section, sea turtle nesting in Georgia is primary by loggerhead sea turtles occurring from late May to mid-August. Green, Kemp's ridley, and leatherback sea turtles nest infrequently in Georgia each year. Hawksbill turtles do not nest in Georgia and are rarely found in Georgia coastal waters. Given this information, analysis on effects to sea turtles will focus on loggerhead sea turtles.

Under the 2020 SARBO species are appropriately managed at the regional level, as all move throughout the South Atlantic. During the Brunswick Harbor or any other specific project operating under the 2020 SARBO, the annual allowed take for loggerhead sea turtles under the 2020 SARBO is similar to what it was under the 1997 SARBO. Specifically, the 1997 SARBO evaluated the loss of 35 loggerhead sea turtles annually (observed lethal take). The 1997 SARBO did not account for unobserved take, as that was not common practice at that time. The 2020 SARBO evaluated loggerhead sea turtle take including 107 observed lethal takes + 107 unobserved lethal takes per 3 consecutive year period to account for annual variation as is now common in their biological opinions. For context, 107 observed lethal takes per three years is an average

of 35.6 observed lethal takes per year, similar to the 1997 SARBO. Since 1997, the maximum recorded observed lethal loggerhead sea turtle take was 18 in one year with an average of 9 observed lethal loggerhead lethal take per year. USACE has and will continue to closely monitor all take (lethal and non-lethal) and adjust dredging operations or cease dredging as deemed appropriate based on multiple considerations. USACE would not and could not allow a single project to use all take covered since it must manage all USACE navigation covered under the 2020 SARBO.

According to genetic work done in the Brunswick and north Florida area, it appears that there may not be as much fidelity of loggerhead sea turtles to a specific nesting beach as previously thought. This same analysis also seems to indicate that there are more loggerhead females than previously thought (GADNR 2020) See “Assessment of the demographic recovery criteria for the Northern Recovery Unit of loggerhead turtles (*Caretta caretta*) using genetic mark-recapture including implementation of high priority recovery actions.” Grant Number: NA16NMF4720076. Project Duration: July 1, 2016 – June 30, 2020).

According to a 2021 NMFS biological opinion, “NMFS (2009f) estimated the minimum adult female population size for the NWA DPS22 in the 2004-2008 time frame to likely be between approximately 20,000-40,000 individuals (median 30,050), with a low likelihood of being as many as 70,000 individuals. NMFS (2011a) preliminarily estimated the loggerhead population in the Northwest Atlantic distinct population segment (NWA DPS) along the continental shelf of the Eastern Seaboard during the summer of 2010 at 588,439 individuals (estimate ranged from 381,941 to 817,023) based on positively identified individuals, with the possibility of increasing to approximately 801,000 individuals when including data on unidentified sea turtles that were likely loggerheads. This is an underestimate of the total population of loggerheads since it did not include Florida’s east coast south of Cape Canaveral or the Gulf of Mexico, which are areas where large numbers of loggerheads can also be found. In other words, it provides an estimate of a subset of the entire population. These numbers were derived prior to additional years of increased nesting.” (NMFS 2021)

According to the status of the species section in a recent NMFS biological opinion, loggerhead sea turtles in the northern recovery unit (NRU) “are showing improved nesting numbers and a departure from the declining trend. Georgia nesting has rebounded to show the first statistically significant increasing trend since comprehensive nesting surveys began in 1989 (Mark Dodd, GADNR press release, <http://www.georgiawildlife.com/node/3139>). South Carolina and North Carolina nesting have also begun to shift away from the past declining trend. Loggerhead nesting in Georgia, South Carolina, and North Carolina all broke records in 2015 and then topped those records again in 2016. Nesting in 2017 and 2018 declined relative to 2016, back to levels seen in 2013 to 2015, but then bounced back in 2019, breaking records for each of the three states and the overall recovery unit.” Loggerhead nesting totals for the NRU are provided in the table below (NMFS 2021).

Table 29. Total Number of NRU Loggerhead Nests (GADNR, SCDNR, and NCWRC nesting datasets compiled at Seaturtle.org).

Nests Recorded				
Year	Georgia	South Carolina	North Carolina	Totals
2008	1,649	4,500	841	6,990
2009	998	2,182	302	3,472
2010	1,760	3,141	856	5,757
2011	1,992	4,015	950	6,957
2012	2,241	4,615	1,074	7,930
2013	2,289	5,193	1,260	8,742
2014	1,196	2,083	542	3,821
2015	2,319	5,104	1,254	8,677
2016	3,265	6,443	1,612	11,320
2017	2,155	5,232	1,195	8,582
2018	1,735	2,762	765	5,262
2019	3,945	8,774	2,291	15,010
2020	2,786	5,551	1,335	9,672

Given the above information – the increased number of loggerhead sea turtles and their ability to nest along the southeast coast – the impact to loggerhead sea turtles from utilizing any of the possible minimization measures (including dredging outside the traditional windows) is not expected to significantly impact the species especially since the total lethal take limit for all projects covered under the 2020 SARBO is limited to 107 observed lethal loggerhead take per three-year period and USACE has a long history of managing hopper dredging projects without excessive take. Since 1997, no more than six observed lethal loggerhead sea turtle takes have occurred at a single project covered under SARBO. No more than four have occurred at Brunswick. The flexibility obtained by fully utilizing the risk management process in the 2020 SARBO and the ability to use any of the minimization measures reduces risk to all listed species compared to the NAA which constrains the minimization measures that can be utilized and the NAA has greater risk to the critically endangered NARW and Atlantic sturgeon in the action area.

Overall, as the O&M action alternative would incorporate the 2020 SARBO requirements into O&M dredging, including the risk-based management approach detailed in 2020 SARBO Appendix J and the PDCs in the 2020 SARBO Appendix B, no significant impacts are anticipated.

4.6. Air Quality

No Action

O&M dredging would continue under the NAA, O&M dredging is not expected to adversely affect air quality in the study area. With respect to air quality and vessel traffic, the economic forecast anticipates that the frequency of vessels calling on Brunswick Harbor will increase during the period of analysis. Under the NAA the transportation efficiencies as proposed under the action alternatives would not occur, which may have a negligible adverse effect on air quality due to idling ships or ships remaining longer in the channel.

Alternative 5

With implementation Alternative 5, air quality will remain unchanged as no dredging beyond existing O&M would occur. With respect to air quality and vessel traffic, the economic forecast anticipates that the frequency of vessels calling on Brunswick Harbor will increase during the period of analysis, given the limited transportation efficiency benefits that would be realized under this alternative, nominal beneficial effects to air quality may occur. Therefore, under Alternative 5, no effects to air quality are anticipated.

Alternatives 2, 3, 4, 6, 7, 8 & 9

With implementation of the above alternatives, minor temporary adverse impacts to air quality will occur during the approximately one-year construction period. The study area is currently an air quality attainment area and neither the new work project nor future O&M dredging would change this designation. During the study analysis period, it is anticipated that number of vessels calling on the Port of Brunswick is expected to almost double. Transportation efficiencies that would be realized through the implementation of these action alternatives may have a minor beneficial effect on air quality, as vessels would move more efficiently through the harbor and navigation channel and reduce sources of mobile air pollutants.

O&M Dredging Action Alternative

Under the Action Alternatives, the anticipated O&M average annual quantities dredged for Brunswick Harbor for Alternatives 2, 3, 4, 6, 7, 8 & 9 would increase from approximately 390,000 yards to approximately 406,900 cubic yards. It is anticipated that there would be no change to the inner and outer harbor shoaling rates from any of the action alternatives. The increase of 16,900 CY of material is nominal compared to annual maintenance amounts, this increase in material would not result in any changes to maintenance dredging activities. Also proposed under the action alternative is the elimination of the environmental window for hopper dredging, elimination of the hopper window would not result in an increase in maintenance activities, as it would not affect shoaling rates and the amount of maintenance material dredged. Therefore, there would be no effect to air quality from continued O&M dredging as described in the Action Alternative.

4.7. Water Quality

No Action

Under the NAA, O&M dredging to maintain the currently authorized depth would continue. This amount includes approximately 390,000 cubic yards in the inner harbor reach and 1,219,000 cubic yards in the outer harbor or entrance channel. Inner harbor dredged material is disposed of in the Andrews Island DMCA and outer harbor dredged material is disposed of in the Brunswick ODMDs. O&M dredging, using all dredge types including cutterhead, clamshell, and hopper dredges, will occur annually as needed based on shoaling rates. Dredging activities can affect salinity, turbidity, and dissolved oxygen levels, with primary concern for turbidity and dissolved oxygen levels.

Turbidity

The suspension of sediment in the water column during dredging and material placement can result in turbidity in the area. The type of dredging equipment used can result in varying levels of turbidity, total suspended solids, and sedimentation. Dredging equipment is generally designed to scoop (e.g., mechanical dredges such as clamshell and bucket dredges), suction up (e.g., cutterhead pipeline and hopper dredges), or to smooth over/level out sediments (e.g., bed-leveling). The placement method of dredged sediments can also affect turbidity such as hopper dredge overflow that allows water to run off of the sediment collected in the hopper, effluent from DMCA, and bottom dump into the ODMDs. Generally dredging and material placement-generated turbidity plumes are limited to an area only a few hundred feet to a few thousand feet and most turbidity settles out quickly once dredging or material placement is complete (2020 SARBO Section 3.1, p.96).

The distance suspended solids can travel outside of the project footprint can vary dramatically depending on the density of the suspended solids (generally referred to as the percent of fines in the material) and local hydrographic patterns, such as the local tides and currents. The velocity of water movement in the area can affect the time that suspended solids remain in the area. For example, riverine environments with an outgoing tide will flush away turbidity quicker than areas with less current such as an estuary with limited tidal flushing. In rivers, the currents also act to compress the turbidity plume as it moves downstream and settles, reducing the overall area/volume affected by it (2020 SARBO Section 3.1, p.97).

Inner Harbor

The inner harbor is open water that receives semi-diurnal tidal flushing from St. Simons Sound. As a result, the water in the harbor is well-mixed, and tidal flushing flushes away any turbidity plumes created by dredging. The areas of higher turbidity are localized and normalize quickly in riverine environments once dredging activities are concluded. Additionally, within the Inner Harbor/Cedar Hammock Range, there is 5 minute overflow restriction for hopper dredging, this restriction further minimizes any impacts to turbidity. Any turbidity impacts from maintenance dredging within the Inner Harbor are temporary and minor.

Entrance Channel

Entrance channel is open water and subject to wave action and ocean currents. Any turbidity plumes created by maintenance dredging in the entrance channel quickly disperse, and impacts are temporary and minor.

Andrews Island DMCA

Suspended particulate and turbidity levels are expected to undergo minor increases during dredging activities and effluent discharge; however, suspended sediment of this type will quickly fall out of the water column and return to normal conditions. No significant effects would occur as a result of these increases. Effluent from Andrews Island DMCA would be discharged into the East River and Turtle River. The Corps was recently issued a new CWA 401 Water Quality certification (WQC), which included conditions for effluent from Andrews Island DMCA. The Corps will follow these conditions, and maintenance dredging is not expected to violate any State water quality certification conditions.

ODMDS

Turbidity at the ODMDS can be substantial during placement operations. However, wave action and ocean currents at the placement site disperses sediments, and the area would normalize quickly. Turbidity impacts would be temporary and localized, and no significant effects are anticipated.

Dissolved Oxygen

Maintenance dredging can temporarily impact dissolved oxygen levels at the site of the active dredging. Generally, dredging is believed to reduce dissolved oxygen levels as it disperses sediment in the water column, thereby increasing sediment oxygen demand. Impacts to dissolved oxygen are therefore expected to be similar as described for turbidity. A recent study conducted by USACE for both hopper dredging and mechanical dredging indicates that dredging has minimal impacts on DO levels (ERDC 2020). As noted above for turbidity, turbidity is expected to disperse quickly due to tidal flushing in the Inner Harbor and wave and ocean currents in the Entrance Channel. Therefore, any impacts to dissolved oxygen are similar to turbidity; localized, temporary and minor.

Overall, any impacts to water quality would normalize quickly at the conclusion the maintenance dredging and dredged material placement. Because of the vintage nature of the 1998 CWA 401 Water WQC issued by Georgia Environmental Protection Division, a new 401 WQC was issued on October 26, 2020. Terms and conditions of the October 2020 401 WQC would be followed for any O&M dredging. Therefore, overall impacts from maintenance dredging in the NAA are temporary and minor.

Alternative 5

Under Alternative 5, no physical modifications to the channel are proposed and no impacts to water quality are anticipated.

Future Conditions with Alternatives 2, 3, 4, 6, 7, 8 & 9

Alternatives 2, 3, 4, 6, 7, 8, and 9 are comprised of alternatives that are both stand-alone and in combination. With implementation of the above alternatives, minor temporary adverse impacts to water quality will occur during the approximately one-year construction period.

The project proposes to use hydraulic pipeline cutterhead dredging to implement the proposed action. In general, cutterhead dredges utilize the rotational motion of the cutterhead to size and move the material towards the dredge suction inlet and the dredging cutterhead is not operated until it is fully embedded in the sediment. While this dredging method may create a small turbidity plume, the plume is expected to be localized around the dredging head. Dredged material is then efficiently piped away to a disposal area without having to transfer the material up through the water column in a bucket or to an offshore location. Cutterhead dredging pumps near-surface water to the cutterhead blade to improve excavation efficiencies and material recoveries. This action draws in a portion of the more oxygen rich surface water and moves it to the sea floor where DO levels typically are lower. A recent study (USACE 2019b) measuring changes in DO around a cutterhead dredge in the Savannah River noted that the greatest increase in DO occurred in the bottom third of the water column where the cutterhead was operating. Changes in DO in the bottom of the water column were most notable within 50 meters downstream of the dredge and returned to background levels within 100 meters of the dredge. All changes occurred directly downstream and did not extend the width of the river.

In a similar Savannah River study, ERDC (ERDC, 2019) reported that the cutterhead dredge *Hampton Roads* pumped 480-700 gallons per minute of water from 0.7 meters depth down to the cutterhead operating at the river bottom. Because of the very small footprint where the cutterhead dredge is removing sediment once embedded, the area of higher turbidity and lower DO are localized and normalize quickly in riverine environments once dredging activities are concluded. Most of the study area is open water that receives semi-diurnal tidal flushing from St. Simons Sound. As a result, the water in the harbor is well-mixed with a relatively uniform salinity, DO, and other important water quality parameters. Any impacts to water quality would be temporary and minimal, and project impacts are considered discountable and insignificant.

Andrews Island DMCA: Effluent from Andrews Island would be discharged into the East River and Turtle River in accordance with Section 401 and Section 303 of the Clean Water Act Water Quality Certification and monitoring rules (GA-EPD 2020). The effluent could contain sediments that in turn could be released into the East River and Turtle River and subsequently deposited in habitat located downstream. However, once the dredged material is placed, the sediments can settle out before the effluent is discharged into the river. As a result, most of the sediment remains within the DMCA and would not be discharged with the effluent or enter the water column. As a condition of the GADNR-EPD issued 401 WQC, sediment proposed to be dredged in the bend widener and turning basin were analyzed for contaminants. Results show that

placement of the proposed dredged sediments into the Andrews Island DMCA is not expected to result in any release which may cause a violation of state water quality standards or impact the aquatic ecosystem (See Appendix L). The amount of effluent that would be discharged into the East River and Turtle River would be minimal compared to the volume of water currently within the river. Any suspended solids within the effluent would be diluted in the water column (GPA 2015). Additionally, the Corps would follow the terms and conditions outlined in the October 26, 2020 401 WQC . Based upon the project design and the minimal short-term impacts associated with the dredging, there would be no long-term impacts to water quality, and only short-term negligible impacts.

O&M Dredging Action Alternative

Additional maintenance material for O&M dredging related would increase from approximately 390,000 yards to approximately 406,900 cubic yards. This additional maintenance material resulting from the new work is a nominal amount (16,900 CY) and there is sufficient capacity in the Andrews Island DMCA. The nominal amount of maintenance material resulting from the new work would not result in any changes to dredging activities.

Continued O&M would fully utilize the minimization measures in the 2020 SARBO, and as noted in Section 3.8, this would result in using the risk-based management approach to determine the best time of year to accomplish dredging, including the possible use of hopper dredging during the warmer months in the entrance channel. All other dredging activities would also utilize the risk-based method, but are expect to be similar to the NAA.

As described under the NAA, dredging activities can affect salinity, turbidity, and dissolved oxygen levels. Most of the inner harbor is open water that receives semi-diurnal tidal flushing from St. Simons Sound. As a result, the water in the harbor is well-mixed with a relatively uniform salinity, DO, and other important water quality parameters. Any adverse impacts to water quality would be temporary and minor. As the action alternative would not result in changes to dredging practices within the inner harbor, there are no expected changes in the level of impacts to water quality as those described under the NAA.

Dredging during the warmer months may result in effects to dissolved oxygen, as warmer temperatures increase biological activity resulting in higher dissolved oxygen demands, and naturally lower dissolved oxygen levels. Hopper dredging during warmer months may occur in the Cedar Hammock Range and in the open water of the entrance channel.

To better understand how dredging during summer months may impact turbidity and dissolved oxygen, the Corps' Engineer Research and Development Center (ERDC) performed water quality sampling during the summer months of 2020 measuring turbidity and DO levels in the Beaufort Inlet in South Carolina. Sampling units (EXO

sondes) set up within the channel limits at various depths and distances continuously recorded data as the dredges moved and as tides shifted. The water quality sampling in Beaufort Inlet occurred during July 2020 as a result of the resource agencies authorizing one-time hopper dredging outside of the 1 December – 15 April window for the Regional Hydraulic Dredge Contract (RHDC). A member of the ERDC team measured turbidity plumes and DO levels at various depths adjacent to the active hopper dredge for several days. The Beaufort Inlet study reported negligible increases in turbidity and decreases in DO. Hopper dredging in July in Range B, Beaufort Inlet observed turbidity that was elevated up to 11 NTU that dissipated within 10 minutes. Dissolved oxygen observed very minor decreases for less than 4 minutes and never dropped below 6 mg/L (USACE ERDC, 2020).

ERDC also sampled turbidity and DO levels in the Cape Fear River adjacent to an active mechanical dredge. Water quality studies occurred in January and July 2020 and did not observe any notable decreases in DO from mechanical clamshell dredging either time. The January sampling occurred in an area of relatively lower flows with silty-clay sediment which is sometimes anoxic. There was a drop in dissolved oxygen during the tide change; however, DO never dropped to a level that would be deleterious to aquatic organisms in the area. The July data were taken during the summer when DO mg/L is typically lowest throughout the year. The July sampling was conducted where sediments were mostly sand which are rarely anoxic. DO never decreased below 4.8mg/L (75% saturation) around the dredge during sampling operations which is over 2-times greater than values that are considered problematic (2.0mg/L) for sturgeon.

While conditions in Brunswick Harbor are not identical to Cape Fear or Beaufort Inlet, many conditions are similar; southeast coastal systems that subject to tidal flushing and experience lower DO levels during warmer months because of higher biological oxygen demand. Both the Savannah River 2019 ERDC cutterhead dredge DO studies and the 2020 ERDC study demonstrate negligible decreases in DO and turbidity resulting from dredging. The 2020 ERDC study further demonstrates that dredging in warmer summer months is also expected to have negligible impacts to DO.

Overall, the proposed changes to maintenance dredging, notably conducting maintenance dredging in the warmer months, are not expected to have significant adverse effect, as water quality would normalize quickly at the conclusion of the O&M dredging, and there is not expected an appreciable difference from the NAA. Additionally, the Corps would follow the terms and conditions outlined in the October 26, 2020 401 WQC.

4.8. Cultural Resources

No Action

With implementation of this alternative, no impacts to cultural resources or historic properties are anticipated. Standard operations currently in place would continue and no

ground disturbing activities would occur. O&M dredging that would occur would be carried out within the navigation channel in previously disturbed areas. No new disposal areas would be required for the dredged material. Upland disposal would consist of material placed into Andrews Island DMCA. Andrews Island DMCA has been used for dredge material disposal since 1961. Use of this area would have no anticipated impacts to cultural resources. Remote sensing surveys and diver identifications of anomalies performed in 1997, 2007, and 2017, identified no cultural resources of significance. Although additional cultural resource investigations are not considered necessary due to a lack of cultural resources identified in this area that would be adversely affected, surveys will be conducted in accordance with the PA to ensure Section 106 compliance. A low likelihood of previously unidentified cultural resources is anticipated based on the results of past surveys in the area (Tuttle and James 1999, Watts et al. 2017). If unanticipated cultural resources are identified during these surveys, little to no effects are still anticipated.

Alternative 2

Implementation of Alternative 2 has the potential to cause negative impacts to cultural resources. Dredging impacts on submerged cultural resources can be classified as direct and indirect. Direct impacts are associated with damage caused by the dredging equipment itself. While the most destructive impacts would be related to cutterhead damage, submerged cultural resources and wreck remains could also be negatively impacted by the mooring and anchoring of the dredge. Dredging in undisturbed deposits in the area around the bend widener would have the potential to cause direct negative impacts to submerged cultural resources, such as shipwreck remains and prehistoric archaeological sites. Indirect impacts would be associated with exposure or burial of submerged cultural resources and shipwreck remains.

Section 2.10 contains a list of shipwrecks that have been identified as lost in the Brunswick area that date back to the colonial era. As the exact locations of these wrecks are unknown, there is high potential that unrecorded resources exist in the APE. Remote sensing surveys (side scan sonar and magnetometer) of the proposed areas will be conducted in accordance with the PA executed between the Corps and the GA HPD (Appendix H). The agreement contains mitigation strategies that would be carried out if any NRHP-eligible resources are located that cannot be avoided through design modification or refinement. Execution of the PA ensures that impacts to cultural resources would have minor effects.

Dredged material would be disposed of in an upland disposal area (i.e., the existing Andrews Island upland disposal area). Placement of dredged material has the potential to bury cultural resources. Burial from sedimentation could have both positive/beneficial and negative impacts. Sediments placed on top of archaeological sites could result in in-situ preservation of the resource. Negative impacts would occur as the resource would no longer be easily accessible for scientific research or investigation.

The Non-federal sponsor owns the parcel proposed for the staging area and no cultural resources investigations would be required to use the parcel as it has been used

previously and no impacts to cultural resources are anticipated with continued use. Should other staging areas be identified through design and alternative refinement, cultural resources background research and investigations would be carried out in accordance with the PA during PED if the area had not been used previously.

Alternative 3

Implementation of Alternative 3 would result in the same types of impacts from dredging as described in Alternative 2. Two anomalies with signatures indicative of cultural resources were located in 1997 by Panamerican Consultants Inc. (Tuttle and James 1999) in an area adjacent to the existing turning basin. Surveys to relocate and assess these anomalies, including diver investigation, would be carried out in accordance with the PA executed between the Corps and the GA HPD. Surveys would also be conducted in areas where dredging will occur, including a buffer area for mooring and anchoring. NRHP-eligible resources would be avoided if possible, or mitigated in accordance with the PA.

Impacts associated with placement of dredged material would be the same as described in Alternative 2 due to the fact that the same areas would be used.

Impacts associated with the staging area would be the same as described in Alternative 2.

Alternative 4

Implementation of Alternative 4 would result in the same types of impacts from dredging as described in Alternative 2. Remote sensing surveys would be conducted of the areas that would be dredged, including a buffer area for mooring and anchoring. NRHP-eligible resources would be avoided if possible, or mitigated in accordance with the PA.

Impacts associated with placement of dredged material would be the same as described in Alternative 2 due to the fact that the same areas would be used.

Impacts associated with the staging area would be the same as described in Alternative 2.

Alternative 5

Implementation of this alternative has the potential to cause negative impacts to cultural resources. The potential for negative impacts is low due to the fact that no dredging would be required or conducted as this area is in naturally deep water and there is sufficient depth for vessels to navigate. However, there could be effects from increased wave action that may impact cultural resources on the shoreline and underwater near the vicinity of the expanded Federal channel. For these reasons, remote sensing surveys would be conducted of the areas that would become part of the Federal channel, including a buffer area to account from increase vessel wave impacts. NRHP-eligible resources would be avoided if possible, or mitigated in accordance with the PA.

Alternative 6

Implementation of Alternative 6 would result in the same types of impacts from dredging as described in Alternative 2. Remote sensing surveys to relocate and assess these anomalies, including diver investigation, would be carried out in accordance with the PA executed between the Corps and the GA HPD. Remote sensing surveys would be conducted of the areas that would be dredged, including a buffer area for mooring and anchoring. NRHP-eligible resources would be avoided if possible, or mitigated in accordance with the PA.

Impacts associated with placement of dredged material would be the same as described in Alternative 2 due to the fact that the same areas would be used.

Impacts associated with the staging area would be the same as described in Alternative 2.

Alternative 7

Implementation of this alternative would have the same impacts as described in Alternatives 2, 3, and 4 for dredging, placement of dredged material, and staging areas. Cultural resources investigations, avoidance, minimization, and mitigation would be conducted as detailed in Alternatives 2, 3, and 4 in accordance with the PA.

Alternative 8

Implementation of this alternative would have the same impacts as described in Alternatives 2, 3, and 5 for dredging, placement of dredged material, and staging areas. Cultural resources investigations, avoidance, minimization, and mitigation would be conducted as detailed in Alternatives 2, 3, and 5 in accordance with the PA.

Alternative 9

Implementation of this alternative would have the same impacts on cultural resources as described in Alternatives 2, 3, 4, and 5 for dredging, placement of dredged material and staging areas. Cultural resources investigations, avoidance, minimization, and mitigation would be conducted as detailed in Alternatives 2, 3, 4, and 5 in accordance with the PA.

O&M Dredging Action Alternative

O&M dredging, as described in the action alternative, would not result in impacts to cultural resources or historic properties, as there are no identified resources in this area. Standard operations currently in place would continue. O&M dredging that would occur would be carried out within the navigation channel in previously disturbed areas. No new disposal areas would be required for the dredged material. Upland disposal would consist of material placed into Andrews Island DMCA. Andrews Island DMCA has been used for dredge material disposal since 1961. Use of this area would have no impacts to cultural resources, nor would cultural resource investigations be necessary for the disposal area. Any impacts from new work are as described in Alternatives 2-9, O&M dredging in the new work areas would not result in any additional impacts.

4.9. Recreation

Recreational vessels using Brunswick Harbor, St. Simons Sound, or the AIWW would not experience negative impacts from the NAA proposed action alternatives or the O&M dredging activities. Recreational vessels can easily avoid the areas proposed for dredging during their transits to and from the ocean. Alternatives would not impact areas that are known to be popular for recreational vessels to congregate. Most of the river and sound are navigable for recreational vessels, so transits are unlikely to be impeded during project construction. There will be no changes to recreational vessel use from the proposed new work and subsequent O&M dredging activities.

As noted above, the coastal Georgia is an important tourist area, with visitors enjoying the opportunity to view marine wildlife such as dolphins and sea turtles. As the Corps would comply with both the Marine Mammal Protection Act and the ESA, impacts to marine life that is enjoyed by tourists would be minimized. Therefore, impacts to visitor experience of coastal Georgia is not anticipated.

4.10. Aesthetics

With implementation of the NAA and with Alternatives 2 through 9, aesthetics will remain the same. There are no upland projects proposed that would alter viewsheds in the study area. Vessels transiting the channel and dredging equipment are an expected part of the viewshed in the study area, and therefore the project would have no effect to the aesthetics of the area. There will also be no changes to aesthetics from O&M dredging activities as described in the action alternatives, changing the timing of hopper dredging would not affect viewsheds in the area, as noted vessels and dredging equipment are an expected part of the viewshed.

4.11. Environmental Justice

Executive Order (E.O.) 12898 directs Federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. As none of the alternatives estimate any adverse human health or environmental effects, there would also be no adverse effects on minority or low-income populations. A breakdown of those potential populations is shown in Section 2.1.3.

4.12. Noise

No Action and Alternative 5

With implementation of the NAA or Alternative 5 no impacts to current noise levels in the study area are expected. Annual O&M dredging would continue, and noise levels associated with O&M dredging are consistent with background noise levels associated with vessel traffic in the channel.

Alternatives 2, 3, 4, 6, 7, 8 & 9

With implementation of the above alternatives, minor short-term negative impacts from noise during the approximately one-year construction period would be expected.

Equipment used during construction would temporarily raise the noise level in the areas where dredging construction would occur. Construction equipment would be properly maintained to minimize these effects in compliance with local laws.

O&M Dredging Action Alternative

Subsequent O&M dredging associated with the new work is a nominal amount and would not result in additional impacts to noise levels associated with O&M dredging. As identified under the NAA, no impacts to noise levels are expected from annual O&M dredging, as the O&M dredging amounts would not increase with implementation of the action alternative. Therefore, there would not be an increase in dredging activities or noise levels

4.13. Hazardous, Toxic, and Radioactive Waste (HTRW)

Neither the NAA nor action alternatives are expected to cause any of the local Toxic Release Inventory facilities to adversely impact the environment.

No significant changes have been made in Brunswick Harbor since the last Tier III sediment evaluation that would impact channel sediments. No new berths or terminals have been added; however, a permit has been issued to GPA for construction of a new berth at the existing Colonel's Island Terminal. The majority of recent changes in the harbor have been minor to moderate improvements to existing docks, infrastructure and parking facilities.

As a condition of the GADNR-EPD issued 401 WQC, sediment proposed to be dredged in the bend widener and turning basin were analyzed for contaminants. Results show that placement of the proposed dredged sediments into the Andrews Island DMCA is not expected to result in any release which may cause a violation of state water quality standards or impact the aquatic ecosystem. Furthermore, sediment sampling of the proposed dredging reaches indicates that RCRA metals, Chlorinated pesticides, Total PCBs and PAHs are below levels of concern (See Appendix L).

O&M dredging conducted under both the NAA and action alternatives is not expected to affect HTRW. O&M dredging equipment must follow guidelines for the safe operation of the equipment, and must employ best management practices to prevent spills from equipment.

4.14. Climate Change

Climate change assessments are required for all phases of the project life cycle including feasibility and PED, for both existing and proposed projects. Because climate science is continuing to evolve, additional climate assessments may be performed during future project phases, which may include quantitative climate assessments on SLC and/or updated hydrology.

The proposed channel modifications were modeled in a 2D Adaptive Hydraulic modeling system (AdH) and no increase in water levels or velocities throughout the

channel were observed. Therefore, it is assumed that the channel modifications will not have an impact on water levels or velocities from the existing water level and therefore, SLR will have the same effect on the NAA as compared to the other alternatives. Comparison of water levels between alternative depths to the FWOP condition, using the low, intermediate, and high sea level rates, showed no difference due to the project modifications. O&M dredging under either the NAA or action alternatives would maintain the authorized depth and therefore would have the effects as described above.

4.15. Cumulative Impacts

As this study has been prepared in accordance with the CEQ regulations that were in place prior to September 2020, a cumulative effects analysis is included. The CEQ regulations (40 CFR 1508.7, prior to September 2020) requires an analysis of the cumulative impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions, regardless of who undertakes these other actions. Cumulative effects are not caused by a single project but include the effects of a particular project in conjunction with other projects (past, present, and future) on the particular resource. Cumulative effects are studied to enable the public, decision-makers, and project proponents to consider the “big picture” effects of a given project on the community and the environment. In a broad sense, all impacts on affected resources are probably cumulative; however, the role of the analysis is to narrow the focus of the cumulative effects analysis to important issues of national, regional, and local significance (CEQ, 1997). This section addresses the cumulative effects arising from the alternatives being evaluated as part of this study when combined with other ongoing or proposed actions within and near the Brunswick Harbor study area.

Brunswick Harbor is a deep-draft navigation harbor that serves three distinct commercial facilities. To maintain viable commercial navigation at the Port of Brunswick, dredging efforts, channel improvements, and other navigation works completed by the GPA as well as by the Corps are common occurrences. It is expected that in the future, additional dredging projects will occur as well as routine O&M dredging. The previous dredging efforts have not had any long-term adverse environmental impacts and future dredging efforts are expected to be very similar in nature. The future dredging for both new work and O&M efforts, in conjunction with the alternatives being evaluated as part of this study, are not expected to have any adverse cumulative impacts within the study area. Sufficient room exists in the Andrews Island DMCA and additional O&M quantities are estimated to be minimal.

In addition to new work and maintenance dredging within Brunswick Harbor, the GPA is planning to construct a new pile-supported RO/RO berth which will involve dredging and impact approximately twelve acres of waters of the U.S. as part of the construction effort. The GPA worked with Corps Regulatory Division as well as State and Federal resource agencies to ensure the proper mitigation and monitoring plans were developed to minimize impacts to resources such as rare, threatened, and protected species, wetlands, EFH, air quality, water quality, etc. As a result, the construction and dredging

efforts associated with future new berths, in conjunction with the alternatives being evaluated as part of this study are not expected to have any adverse cumulative impacts within the study area from a watershed and system perspective.

Within the Brunswick Harbor study area, there are also ongoing efforts associated with removing the MV Golden Ray. It is anticipated that removal will be complete by the end of 2021. It is not expected that any part of this removal effort will impact the Federal navigation channel and it is expected that the vessel would be removed before dredging and construction efforts associated with this study would begin. The cumulative impacts associated with the removal efforts would possibly have temporary minor adverse effects. Protective measures in the form of air, species, and pollution monitoring activities are being implemented in a proactive manner to avoid, minimize, and/or mitigate adverse effects resulting from the vessel removal. The adaptive management plan is used to adjust mitigation measures on-site and in real-time for fish, turtles, and marine mammals. Specific mitigation and monitoring measures are being implemented to address entanglement or entrapment risks during project implementation and adaptively managed through to completion.

No Action Alternative

With implementation of the NAA, standard O&M dredging operations at Brunswick Harbor would continue with no modifications to the federal navigation channel and there would be no additional adverse cumulative impacts to aquatic resources, EFH, wetland habitat, water quality, air quality, or noise within the study area. Further, with implementation of the NAA, there would be no adverse cumulative impacts to cultural resources or historic properties. O&M dredging that would occur would be carried out within the navigation channel in previously disturbed areas and therefore impacts to cultural resources would remain low, as well as the risk of encountering new HTRW material.

Under the NAA, the Corps would not be able to utilize all minimization measures available in the 2020 SARBO. Effects to ESA-listed species are described in Section 4.5. Long-term adverse cumulative impacts to ESA-listed species may occur, as the risk-based, adaptive approach to protection of the ESA-listed species from 2020 SARBO would not be followed.

No other significant cumulative impacts associated with the No Action Alternative and other past, present, and foreseeable actions have been identified during this assessment.

Alternatives 2, 3, 4, 5, 6, 7, 8 & 9

Alternatives 2, 3, 4, 6, 7, 8, and 9 would all involve widening the existing Brunswick Harbor Federal navigational channel. With implementation of these alternatives, there would be minor and temporary impacts to air quality, water quality, noise, and aquatic resources within the immediate study area as a result of the dredging and construction efforts. It is expected that with implementation of the appropriate best management practices during construction, that the river system within the study area would recover

very shortly after dredging and construction is completed. While Alternative 5 would result in widening of the authorized navigation channel, this alternative does not require any dredging, and cumulative impacts would be insignificant.

Regardless of the alternative selected, the Corps will comply with the relevant Project Design Criteria in the 2020 SARBO in Appendix B to protect ESA listed species.

Additionally, it is anticipated that the cumulative impacts associated with EFH for the alternatives being evaluated are temporary and minimal. Within the study area, there are abundant areas of similar, shallow water habitat immediately adjacent to the proposed areas where dredging will occur. The temporary and minimal impacts associated with the proposed dredging activities will not reduce the quality or quantity of EFH within the study area and no adverse cumulative effects are expected to EFH from these alternatives.

With implementation of alternatives 2, 3, 4, 6, 7, 8, and 9, there is the potential to cause adverse effects to historic properties. Dredging in undisturbed deposits has the potential to cause direct adverse impacts to submerged cultural resources such as shipwreck remains and prehistoric archaeological sites. Surveys of the proposed areas will be conducted in accordance with the PA to be executed between the Corps and the GA HPD. NRHP-eligible resources would be avoided, if possible, or mitigated in accordance with the PA.

No other significant cumulative impacts associated with the alternatives 2, 3, 4, 6, 7, 8, and 9, and other past, present, and foreseeable actions have been identified during this assessment. These alternatives were developed and evaluated using a systems and watershed context, and it is anticipated that implementation of these alternatives, including the recommend plan, will not cause any long-term impacts to the Brunswick Harbor system/watershed. Coordination with the appropriate state and federal resource agencies will continue to ensure future actions do not result in direct or indirect impacts to natural resources in the vicinity of the study area where the channel modifications to the Brunswick Harbor are planned to occur.

O&M Dredging Action Alternative

Cumulative effects from continued O&M would be similar as those described under action alternatives 2-9. However, the risk-based, adaptive approach for minimizing effects to ESA-listed species would be able to utilize a range of minimization measures, resulting in potential long-term beneficial effects to all the ESA-listed species covered by the 2020 SARBO. As previously indicated, the 2020 SARBO allows for a risk-based approach to maintenance dredging and adjustments to dredging practices as more information is learned about effects to all the ESA-listed species (2020 SARBO, section 2.9.2 and Appendix J). This approach would result in long-term minimization of effects from maintenance dredging and other covered activities.

5. Recommended Plan

The USACE Vertical Team endorsed Alternative 8 as the Recommended Plan at the Agency Decision Milestone held on October 12, 2020. Once the Recommended Plan was selected the PDT finalized engineering designs, developed a certified construction cost estimate, updated economic benefits and costs, and implementation requirements. Chapter 5 provides a description of the Recommended Plan. Further details can be found in technical appendices.

5.1. Description of the Recommended Plan

Alternative 8 is a combination of widening at the bend widener, turning basin expansion, and creation of a meeting area at St. Simons Sound. Alternative 8 includes dredging 205,000 cubic yards of material at the bend widener, 346,000 cubic yards at the turning basin expansion, and 0 cubic yards at the meeting area at St. Simons Sound for a total of approximately 551,000 cubic yards of dredged material. Dredging will occur to a depth equal to the existing Federal channel (-36 feet MLLW + 2 feet allowable over-depth). Approximately 7,000 linear feet of channel would be dredged under the proposed action. The AAEQ benefit is \$2,943,000, AAEQ cost is \$637,000, and annual net benefit is \$2,306,000. The benefit-to-cost ratio is 4.6. Alternative 8 is the recommended plan. The non-Federal sponsor (GPA) supports this plan and there is no Locally Preferred Plan.

5.2. Dredging and Dredged Material Management

A hydraulic pipeline cutterhead dredge will be used to widen the turning basin and bend widener. This is a conventional dredging method that is routinely used for deep draft navigation projects throughout the county. The dredge works using a rotating cutter apparatus surrounding the intake of a suction pipe to cut and remove material. A detailed description of this type of dredge and its operation can be found in EM 1110-2-5025 (USACE, 2015). For future Operations and Maintenance (O&M) activities in the bend widener and turning basin a variety of dredging equipment could be used such as cutterhead, hopper dredge, and clamshell dredge dependent on the O&M requirements for the dredge cycle. Dredged material will be disposed of in the Andrews Island DMCA which has sufficient capacity for the 551,000 cubic yards plus approximately 16,000 cubic yards of annual O&M dredging (for at least 20 years). The current capacity of Andrew's Island is approximately 15.5 million cubic yards. The navigation improvements are expected to increase annual O&M dredging for Brunswick Harbor by approximately 1%. This will include a minimal cost increase to annual O&M dredging. Table 30 illustrates the relationship between the recommended plan and Brunswick Harbor Federal Channel O&M Dredging.

Table 30. Brunswick Harbor Federal Navigation Channel Dredging

Brunswick Harbor Dredging O&M dredging in relation to Recommended Plan Implementation	Cubic yards (yd³)
Proposed new work dredging (Recommended Plan – Alt 8)	551,000
Existing annual O&M dredging* that is disposed of in Andrews Island DMCA.	390,000
Estimate of O&M dredging that will be needed due to recommended plan implementation (additional material disposed of in Andrew's Island DMCA)	16,900
Estimate of future annual O&M dredging after recommended plan implementation that will be disposed of in Andrew's Island DMCA	406,900
Existing annual O&M dredging* that is disposed of in the offshore disposal site	1,219,000
Estimate of total annual Brunswick Harbor Navigation Operations and Maintenance dredging (406,000 + 1,219,000)	1,625,000

* Average over 10-year period. Brunswick Harbor O&M dredging fluctuates on a yearly basis due to dredging needs and funding availability. On average, over a 10-year period, approximately 390,000 yd³ of material is dredged from the Brunswick Harbor Federal Navigational Channel and disposed of in the Andrews Island DMCA. This number fluctuates due to navigational needs. For instance, some years shoaling patterns are different due to events like severe storms and the navigation channel could require more or less dredging. Funding availability also impacts the rate and frequency of navigation channel dredging.

A 1% increase (16,900 yd³) to annual O&M dredging is expected due to implementation of the recommended plan.

It is the Corps of Engineers policy to accomplish the disposal of dredged material associated with the construction or maintenance dredging of navigation projects in the least costly manner. Disposal is to be consistent with sound engineering practice and meet all Federal environmental standards including the environmental standards established in Section 404 of the Clean Water Act of 1972 or Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972, as amended. This constitutes the base disposal plan for the navigation purpose. The current Dredge Material Management Plan (DMMP) was developed during the previous harbor deepening in 1998 (USACE – SAS, May 1998).

Upland Disposal

Upland disposal will consist of dredged material pumped into Andrews Island DMCA, an existing disposal area typically used for placement of sediments removed during O&M dredging of Brunswick Harbor. The area is completely diked and covers about 770 acres. There are five existing weirs in the disposal area. The main weir consists of three 48-inch weirs side-by-side which are connected to one 60-inch HDPE outfall pipe which discharges to the East River. The other two 48-inch weirs are currently not in use for maintenance dredging but are available after ditching is performed to allow water to flow to them.

Weir #3, located on the northwest corner of Andrews Island DMCA, was used during the previous Brunswick Harbor deepening, at which time GADNR-CRD noted erosion of approximately a half-acre of salt marsh. The Corps acknowledges that all weirs should

operate in a manner that does not exacerbate erosion issues and does not expect additional erosion as a result of this project. In response to concerns from GADNR-CRD, prior to the use of Weir #3 for this project, the Corps will conduct a pre-construction survey to evaluate the condition of the marsh in the vicinity of the Weir #3 outfall. At a minimum, the phrase “Discharge flow will be maintained to prevent scour or erosion” will be included in dredging contracts to ensure that the weir is operated in a manner that minimizes erosion risk. A post-construction survey will be completed, and if erosion is found that is attributable to the operation of the weir, a plan will be developed to restore the marsh to its pre-construction condition.

In 2009, the Andrews Island DMCA dikes were raised to elevation +44 feet Mean Low Water (MLW) to increase capacity. The dike improvement is expected to extend the remaining useful life of the site to about 50 years with two future dike raisings planned.

Beneficial Use

Dredged material from this project has the potential for numerous beneficial uses. Coordination between the Corps and resource agencies is ongoing, and to date the following opportunities have been identified:

- GANDR-CRD proposed adding material to repair erosion along the northern and northeastern edge of the existing Bird Island in St. Simons Sound. It was estimated that this placement would include less than 25,000 CY of material, whereas the proposed bend widener located nearby would consist of approximately 205,000 CY of dredged material.
- USFWS proposed several options including placement nearshore or onshore at Jekyll Island, restoration of the existing Bird Island to as-built volumes, creation of up to four new shorebird nesting islands between St. Simons and St. Andrews Sounds, and possibly marsh thin layer placement. USFWS acknowledged that the proposed areas would require additional coordination with NMFS for EFH impacts, the Federal Aviation Administration (FAA) due to the position of the existing Bird Island along the flight line approach to St. Simons Island airport, and GADNR-WRD at a minimum.

For a beneficial use opportunity to be feasible in the context of this study, it must be a part of the “base plan”, also known as the Federal Standard (See Section 3.6 for a discussion on the Federal Standard).

The Corps evaluated the feasibility of beneficial use proposals in coordination with the recommending agency. Geotechnical borings were collected as part of the feasibility-level engineering design and the physical and chemical characteristics of the sediments were analyzed to estimate the volume of material suitable for beneficial use. Based on the sediment analysis results most of the dredged material is suitable for beneficial use, however, beneficial use exceeds the base plan so is not economically feasible in the context of this study. The two most viable options for beneficial use (placing material on the existing Bird Island or creating a new Bird Island near the location of the proposed

dredging) contain required actions that cause costs to exceed the base plan. In the case of restoring Bird Island, only 36,000 cubic yards would be required. Expanding the bend widener requires removal of 205,000 cubic yards. Therefore, if Bird Island was restored there would still be a need to dispose of 169,000 cubic yards in the Andrew's Island DMCA. Two disposal locations for one feature creates additional costs that make restoring Bird Island cost prohibitive in the context of this study. Creating a new Bird Island requires a significant investment in sediment transport modeling and environmental compliance activities which leads to increase costs. These two options exceed the cost of the Federal Standard (or base plan) and are therefore unable to be included in this study.

5.3. Real Estate Considerations

Georgia Ports Authority (GPA) is the NFS for this feasibility study. All lands needed for construction of the Brunswick Harbor Modifications Study project are NFS owned. The project study consists of widening parts of the Federal channel in Brunswick Harbor to help reduce the difficulty in maneuvering and turning of larger shipping vessels. Excavation to widen parts of the Federal channel will be below mean high water and subject to the government's right of Navigational Servitude. Excavated and dredged material will be disposed of in Andrews Island Dredged Material Containment Area. Access to Andrews Island is also subject to the government's right of Navigational Servitude. The GPA as the NFS will provide a staging area at the port facility during construction. There are no utility/facility relocations associated with this project. No further real estate is required for the project, however as the recommended plan is considered a new project a new Real Estate Certification will be required prior to construction for use of the staging area. This certification will require the NFS to sign a new Authorization for Entry for Construction and Attorney Certificate of Authority to support the project and confirm the prior staging area remains available. The incidental administrative costs associated with the Real Estate Certification are considered creditable to the NFS and are reflected in the Cost Share Table in accordance with Section 101(a)(3) of WRDA 1986 (see Section 5.6)

Should it later be determined that an additional real estate interest is required for the project, the NFS is responsible for providing the lands, easements, and rights-of-way (LER) required to implement the project. See Real Estate Appendix D.

5.4. Fish and Wildlife Coordination Act Considerations

The Corps initiated consultation with the USFWS during a kick-off Planning Charrette held for the state and federal resource agencies on May 17, 2019. Following multiple discussions with USFWS staff on the scope and preliminary selection of alternatives, a draft Fish and Wildlife Service Coordination Act (FWCA) evaluation for the project (Appendix K) was submitted to the Corps on February 18, 2020. The final USFWS response was received May 20, 2020.

- The FWCA evaluation summarily stated that the USFWS had no opposition to any of the proposed alternatives as presented and did not expect significant impacts to fish and wildlife resources under their jurisdiction during project implementation. However, they did enumerate several potential opportunities for the project to mitigate or minimize the effects of storm surge and predicted sea level rise through beneficial use of dredged sediments for Bird Island creation and/or marsh restoration. Recommendations included restoring the existing Bird Island in St. Simons Sound; restoring the Satilla River Marsh Island Natural Area in the mouth of the Satilla River in St. Andrews Sound; and creating a new bird islands in shallow protected areas in St. Simons, Jekyll, and/or St. Andrews Sounds.

The USFWS also recommended dredged material placement offshore that could serve as a source for sand migration onto nearby Jekyll beach, and temporary intertidal and/or supratidal berms to provide foraging/loafing and nesting habitat for shore and seabirds. Finally, the USFWS suggested that the Corps reconsider how we determine the feasibility of beneficial use opportunities for projects. Rather than determining best disposal methods based on the least costly alternative, consistent with sound engineering practices while meeting all federal environmental requirements, they recommend the Corps also consider the societal value of a created feature (e.g., bird habitat, marsh restoration) and costs savings that a feature may produce in future channel maintenance or restorative projects (e.g., fewer beach renourishments needed as a result of naturally occurring onshore sand migration from constructed nearshore feeder berms).

Corps Response

We acknowledge that several stakeholders, including GADNR-CRD and USFWS have identified potential areas for beneficial use of dredged material. Coordination with these potential non-Federal sponsors for beneficial use is ongoing. Rough order of magnitude costs were developed for the beneficial use recommendations and are included in the project record. Unfortunately, beneficial use is unable to be part of the base plan for the Brunswick Harbor Modifications Study. This is due to transportation distance to the proposed beneficial use site and that not all the dredge material is able to go to be used at one beneficial use site. The base plan, or Federal Standard, consists of the disposal or placement costs that are assigned to the navigational purpose of the project. Costs for the base plan are shared with the NFS as outlined in the project cost-sharing agreement.

5.5. Summary of Environmental Consequences and Cumulative Effects of the Recommended Plan

With implementation of Alternative 8, there would be no significant environmental impacts to water quality, existing wetlands, threatened and endangered species, EFH, terrestrial resources and habitat, aquatic resources and habitat and other protected resources within the study area. In order to minimize adverse impacts, the Corps will follow BMPs in its design and operations. In addition, the proposed dredging activity for

the modifications to the Federal channel will be accomplished through hydraulic cutterhead style dredging. The environmental consequences of conducting dredge activities through hydraulic cutterhead dredging are discussed below. O&M dredging will continue in compliance with the Final Environmental Impact Statement, Brunswick Harbor Deepening Project (1998) and 2020 SARBO.

For implementation of the recommended plan (Alternative 8) short term impacts are expected on aquatic resources from cutterhead dredging. The cutterhead dredge minimizes turbidity by piping away the sediments without having to bring them up through the water column in a bucket or transport them to an offshore location. Impacted areas would be available for recolonization and use by benthic organisms once the dredging event ceases, so no irreversible loss of resources would occur. Short-term habitat loss of benthic communities is expected; however, the populations should reestablish once dredging is complete.

The proposed dredging will not limit the density and diversity of the benthic community that becomes reestablished any more so than existing maintenance activities. However, benthic populations in the navigation channel are in a state of flux due to the continual sedimentation and shoaling that creates the need for maintenance dredging (SHEP-EIS 2012). Cumulative effects on Phytoplankton and zooplankton species living in the water column should not be affected any more so than the existing maintenance activities.

Results of recent sampling and analysis of sediments in the turning basin and bend widener areas proposed for deepening do not show significant levels of contaminants of concern (summary report can be found in Appendix L). Similar analyte concentrations were found in previous testing events in which project sediments were determined suitable for beneficial use and upland confined disposal. Therefore, it is not expected that disposal of these sediments into the Andrews Island DMCA and resultant weir discharges will cause violation of state water quality standards or degradation of the aquatic ecosystem.

Environmental impacts to cultural resources will be assessed during the Planning, Engineering, and Design phase in accordance with the October 14, 2020 Programmatic Agreement between the Corps and Georgia State Historic Preservation Officer. As project designs are refined and optimized, impacts to cultural resources caused by dredging and other ground disturbing activities will continue to be minimized and avoided in some cases. The purpose of the PA is to ensure compliance with Section 106 of the NHPA. The PA includes a detailed process for identification, evaluation and mitigation of historic properties. Therefore, pursuant to 54 U.S.C. 306108, 36 CFR 800.4(b)(2), and 36 CFR 800.14(b)(1)(ii), the Corps is deferring final identification and evaluation of historic properties until after project approval, additional funding becomes available, and prior to construction by adhering to the PA.

5.6. Project Implementation

The approved feasibility report is scheduled to be transmitted to Headquarters USACE by October 2021, and a Chief of Engineer's Report is scheduled to be signed by March 2022. Following approval of the feasibility report, a Design Agreement will be executed with the non-Federal sponsor for the Planning, Engineering, and Design (PED) phase, at which point funds must be appropriated by Congress to complete the project design. Project construction would require Congressional authorization and appropriation of funds.

The total cost of the feasibility study is shared (50/50) with the non-Federal sponsor pursuant to the terms of the FCSA executed by the District Commander and the Georgia Ports Authority on April 11, 2019. The cost share for the PED phase and the construction phase will be included in the Design Agreement and Project Partnership Agreement, respectively. Estimated cost shares based on model agreements are included in Table 31 below. The AAQ cost for OMRR&R is \$150,000, which is a 100% Federal cost.

Table 31. Cost Sharing Summary

Federal/Non-Federal Cost Apportionment – NED Plan October 2021 Price Levels (Project First Costs)			
	Total Cost	Fed Share	Non-Fed Share
<i>¹Feasibility Phase [50% Fed / 50% Non-Fed]</i>			
¹ Feasibility Study	\$3,000,000	\$1,500,000	\$1,500,000
<i>²General Navigation Features (GNF) [75% Fed / 25% Non-Fed]</i>			
Dredging and Disposal	\$11,924,000	\$8,943,000	\$2,981,000
Preconstruction, Engineering, & Design	\$1,263,000	\$947,000	\$316,000
Construction Management	\$612,000	\$459,000	\$153,000
LERRs	\$5,000	-	\$5,000
Subtotal – Project First Costs (rounded)	\$13,804,000	\$10,349,000	\$3,454,750
NFS Credit for LERR		\$5,000	-\$5,000 ⁴
NFS Additional 10% Contrib. GNF	\$0	-\$1,380,000	\$1,380,000
Local Services Facilities ³	-	-	-
USCG Aids to Navigation [100% Fed]	\$110,000	\$110,000	\$0
Total Cost Apportionment	\$13,914,000	\$9,084,000	\$4,830,000

¹Cost share from FCSA executed on 11 April 2019.

² Project-specific Design Agreement will be developed following completion of the Final Feasibility Report. Project-specific Project Partnership Agreement will be developed during the PED phase.

³ No local service facilities improvements are required for the project. The existing berthing area depths and bulkheads improvements are sufficient.

⁴Real Estate costs are associated with incidental administrative costs to procure a new Real Estate Certification for the construction staging area. Georgia Ports Authority owns the construction staging area; however, its land value was credited to the GPA during a previous Federal project. The Real Estate Certification will require the NFS to sign a new Authorization for Entry for Construction and Attorney Certificate of Authority to support the project. These costs are creditable in accordance with Section 101(a)(3) of WRDA 1986.

5.7. Risk and Uncertainty

Several risks and mitigation approaches to those risks were identified during evaluation of the alternatives. Key implementation risks related to cultural resource surveys, and shoaling rate assumptions are discussed in this section. Since cultural resources survey will be conducted during the PED phase of the project, actual impacts to historic properties and cultural resources will not be identified until PED and could potentially add time to the schedule if specific mitigation or design readjustment are required to minimize impacts. This risk would be mitigated by frequent coordination with the GA HPD adherence to the process identified in the executed Programmatic Agreement.

Another identified risk is that shoaling may increase as a result of project implementation. This risk was mitigated using a combination of historical O&M dredging data as well as by estimating shoaling rates based on conditional surveys. Future O&M quantities were estimated for each project feature using Brunswick Harbor O&M dredging records provided by the Corps' Operations Division. Dredging records from 2014 to 2020 were evaluated. For the bend widener analysis, a January 2018 survey was compared to the January 2020 survey using Autodesk Civil 3D software. No dredging had occurred in the Brunswick Point Cut Range and Cedar Hammock Range between the two surveys. From this analysis, shoaling rates were determined to be approximately 2,000 CY/year in the location of the bend widener. For the turning basin analysis, O&M dredging records were available and evaluated from 2015 to 2019 for the South Brunswick River near the existing turning basin. Dredging records show approximately 16,000 CY of material was dredged in FY15, 58,000 CY of material was dredged in FY16, and no material was dredged in FY17, FY18, or FY19 near the existing turning basin. The average shoaling rate for this five-year period is approximately 14,900 CY and will be assumed as the future annual shoaling rate for the turning basin.

For the St. Simons Sound Meeting Area, there has been no O&M dredging in the Plantation Creek Range, which is the location for the St. Simons Sound Meeting Area. Velocities are also relatively high (>2.5 knots) in this location, depths range from 40–60 feet MLLW, and shoaling is not expected to occur in the future. These data were incorporated into the cost estimate for each alternative.

The feasibility-phase ship simulation study is considered sufficient to support selection of the recommended plan. The ship simulation study significantly reduced uncertainty regarding ship maneuverability in the turning basin near future Berth 4 and resulted in the minimum turning basin geometry considered adequate for efficient navigation. The effort also reduced uncertainty about vessel transit through the proposed bend widener and confirmed that a geometry similar to the existing downstream bend widener is appropriate to relieve future restrictions. Lastly, the feasibility-phase ship simulation confirmed that the St. Simons Sound, a naturally deep, wide area can be used, without modification, as a meeting area without future transit restrictions.

There is, however, some ongoing residual risk and uncertainty present with forgoing PED-phase ship simulation. For instance, while 44 test runs were completed during feasibility level ship simulation, only 7 runs were duplicates. There would be more opportunity for additional duplicate runs in PED-phase ship simulation. Similarly, only two out of seven Brunswick Harbor Pilots participated during the feasibility level ship simulation. There would be an opportunity to allow for more (or potentially all) pilots to attend and provide additional input during PED-phase ship simulation. Also, there were minor concerns that wind was not included when developing the currents and was rather forced in the simulator. While the pilots did feel the effects of the wind gusts in the simulator, the winds did not properly affect the currents in the hydrodynamic modeling as they should have. Lastly, the Harbor Pilots simulated runs using the HERO Class ship (design vessel) as well as a container ship to feel the large effects of wind gusts on an empty vessel, but there could be a potential opportunity for the Harbor Pilots to perform additional simulations using other vessels such as a bulk carrier. Overall, these residual risks are very low and not expected to change the outcome of the selected alternative nor the current footprint of the channel design. For these reasons, the feasibility level ship simulation effort is considered complete for the Brunswick Harbor Modifications Study.

6. Environmental Compliance

The following table documents compliance with environmental laws, and implementing regulations, and Executive Orders (Table 32) as applicable to the proposed action. (Note: this is not necessarily an exhaustive list of all applicable environmental requirements).

Table 32. Relationship of the Proposed Action to Applicable Federal Laws and Policies

Public Laws		
Title of Public Law	U.S. Code	Compliance Status*
Abandoned Shipwreck Act of 1987	43 U.S.C. §§2101-2106	Full Compliance
Anadromous Fish Conservation Act of 1965, as amended	16 U.S.C. §757a <i>et. seq.</i>	Full Compliance
Archaeological and Historic Preservation Act, as amended	154 U.S.C 312501-312508	Full Compliance
Archeological Resources Protection Act	16 U.S.C 470 as-mm	Full Compliance
Bald Eagle Act of 1972	16 U.S.C. §§668-668d	Full Compliance
Clean Air Act of 1972, as amended	42 U.S.C. Chapter 85	Full Compliance
Clean Water Act of 1971, as amended	33 U.S.C. §1251 <i>et. seq.</i>	Full Compliance
Coastal Barrier Resources Act of 1982	16 U.S.C. §3501-3510	Full Compliance
Coastal Zone Management Act of 1972, as amended	16 U.S.C. §1451 <i>et seq.</i>	Full Compliance
Deepwater Port Act of 1974, as amended	33 U.S.C. §1501 <i>et. seq.</i>	Full Compliance
Endangered Species Act of 1973	16 U.S.C. §1531 <i>et. seq.</i>	Partial Compliance
Estuary Program Act of 1968	16 U.S.C. §1221 <i>et. seq.</i>	Full Compliance
Federal Insecticide, Fungicide, and Rodenticide Act	7 U.S.C. §136 <i>et. seq.</i>	Full Compliance
Fish and Wildlife Coordination Act of 1958, as amended	16 U.S.C. §§661-665; 665a; 666; 666a-666c	Full Compliance
Flood Control Act of 1944, as amended, Section 4	P.L. 78–534	Full Compliance
Magnuson-Stevens Fishery Conservation and Management Act	16 U.S.C. §1801 <i>et. seq.</i>	Full Compliance
Marine Mammal Protection Act of 1972, as amended	16 U.S.C. §1361 <i>et. seq.</i>	Full Compliance

Marine Protection, Research and Sanctuaries Act of 1972	33 U.S.C. §1401 <i>et. seq.</i>	Full Compliance
Migratory Bird Conservation Act of 1928, as Amended	16 U.S.C. §715	Full Compliance
Migratory Bird Treaty Act of 1918, as amended	16 U.S.C. §§703-712	Full Compliance
National Environmental Policy Act of 1969, as amended	42 U.S.C. §4321 <i>et. seq.</i>	Partial Compliance
National Historic Preservation Act of 1966, as amended	P.L. 89-665	Partial Compliance
Native American Graves and Repatriation Act (NAGPRA)	P.L. 101-601	Full Compliance
Noise Control Act of 1972, as amended	42 U.S.C. §4901 <i>et. seq.</i>	Full Compliance
River and Harbor Act of 1888, Sect 11 (as codified)	33 U.S.C. §608	Full Compliance
River and Harbor Act of 1899, Sections 9, 10, 13	33 U.S.C. §§401, 403, and 407	Full Compliance
River and Harbor and Flood Control Act of 1962, Section 207	PL 87-874	Full Compliance
River and Harbor and Flood Control Act of 1970, Sections 122, 209, and 216	PL 91-611; see <i>generally</i> 33 U.S.C. §701 <i>et. seq.</i>	Full Compliance
Safe Drinking Water Act	42 U.S.C. §§300f-300j	Full Compliance
Sunken Military Craft Act of 2004	10 U.S.C. §§113 <i>et. seq.</i>	Full Compliance
Merchant Marine Act	46 U.S.C. §861 <i>et. seq.</i>	Full Compliance
Submerged Lands Act of 1953	43 U.S.C. §1301 <i>et. seq.</i>	Full Compliance
Executive Orders		
Title of Executive Order	Executive Order Number	Compliance Status*
Protection and Enhancement of Environmental Quality	11514/11991	Full Compliance
Protection and Enhancement of the Cultural Environment	11593	Partial Compliance
Floodplain Management	11988	Full Compliance
Protection of Wetlands	11990	Full Compliance
Federal Compliance with Pollution Control Standards	12088	Full Compliance

Offshore Oil Spill Pollution	12123	Full Compliance
Procurement Requirements and Policies for Federal Agencies for Ozone-Depleting Substances	12843	NA
Federal Compliance with Right-To-Know Laws and Pollution Prevention	12856	Full Compliance
Federal Actions to Address Environmental Justice and Minority and Low-Income Populations	12898	Full Compliance
Federal Acquisition and Community Right-To-Know	12969	Full Compliance
Indian Sacred Sites	13007	Full Compliance
Protection of Children from Environmental Health Risks and Safety Risks	13045	NA
Invasive Species	13175	Full Compliance
Consultation and Coordination with Indian Tribal Governments	13175	Full Compliance
Responsibilities of Federal Agencies to Protect Migratory Birds	13186	Full Compliance
Executive Order Facilitation of Cooperative Conservation	13352	Full Compliance
<p>*Compliance Status:</p> <p><i>Full Compliance:</i> Having met all requirements of the statute, E.O., or other environmental requirements.</p> <p><i>Partial Compliance:</i> Not having met some of the requirements at current stage of planning. Compliance with these requirements is ongoing.</p> <p><i>Non-Compliance:</i> Violation of a requirement of the statute, E.O., or other environmental requirement.</p> <p><i>Not Applicable:</i> No requirements for the statute, E.O., or other environmental requirement for the current stage of planning.</p>		

Environmental compliance for the proposed action, including continued O&M, is summarized below:

- Receipt of a Clean Water Act Section 401 Water Quality Certification from GADNR - EPD; Conditional 401 received on October 26, 2020 with construction commencement approval pending review of site-specific sediment sampling. Sampling was completed in November 2020 and results submitted to GADNR-EPD and EPA on February 25, 2021. No response has been received from GADNR-EPD or EPA on the sampling report provided on February 25, 2021. Construction will commence upon GADNR-EPD review and approval of the

sediment sampling report. Additionally, the Corps will comply with the conditions in the 401 WQC for continued O&M of the Federal navigation channel.

- GADNR – Georgia Coastal Zone Management Program; Coastal Zone Management Act (CZMA) Federal Consistency Determination. On April 23, 2021, GADNR - CRD provided conditional concurrence to Corps' CZMA consistency determination for the Brunswick Harbor Modifications Study (BHMS). The Corps found the conditions unacceptable in accordance with § 930.4(a)(2), and views GA-DNR CRD conditional concurrence as an objection. The Corps has concluded that the proposed action is fully consistent with the enforceable policies of the management program (§ 930.43(d)(2)) or, alternatively, that the proposed action is consistent to the maximum extent practicable with the enforceable policies of the management program (§ 930.43(d)(1)). The Corps has notified GADNR-CRD, in a letter dated May 21, 2021, as required in 15 C.F.R. § 930.43(e), of the Corps' decision to proceed with the BHMS after May 12, 2021, which is the end of the 90-day period that is specified in § 930.43(d). Prior to the end of this 90-day period, the Corps and CRD engaged in a good faith effort to resolve differences using an informal process that included representatives of the National Oceanic and Atmospheric Administration, Office of Coastal Management. The Corps objects to the specified conditions because they do not reflect enforceable policies, the State does not have legal authority to require most of the conditions, and because they conflict with Federal legal requirements. Specifically, GA-DNR-CRD's conditions conflict with the ESA by imposing requirements that conflict with the ability of the Federal government to implement the ESA for the protection of all relevant listed species. Second, GA-DNR-CRD's conditions directly conflict with the Corps' ability to comply with the ESA and implement the 2020 SARBO – as legally required – to address risk across the southeast to listed species. Additionally, because certain conditions present a conflict under Section 6(f) of the ESA, they are preempted, and the Corps is consistent with Georgia's coastal zone management plan to the maximum extent practicable without accepting these conditions. Appendix J has been updated to include the April 23, 2021 conditional concurrence from GADNR-CRD and the Corps response dated May 21, 2021.
- USFWS ESA and FWCA consultation- ESA consultation was concluded on June 18, 2020. A final FWCA evaluation was received from USFWS on May 20, 2020
- NMFS ESA consultation conclusion; Corps received a letter of concurrence from NMFS on May 24, 2021, which is included in Appendix I. As stated in the letter of concurrence, ESA consultation for the entire action (new work and O&M dredging), is covered by both the letter of concurrence and by the 2020 SARBO. The letter of concurrence states:

“The 2020 SARBO programmatically analyzes effects from maintenance dredging of authorized federal navigation channels and material placement in the Southeast. However, the 2020 SARBO provides that modification of existing navigation channels (such as the proposed widening of the harbor bend and turning basin here) requires separate

Section 7 consultation. Future maintenance dredging and dredged material placement may then be covered under 2020 SARBO.

This consultation accordingly evaluates those portions and effects of the project not analyzed in 2020 SARBO and incorporates the 2020 SARBO by reference for analysis of effects to ESA-listed species and designated critical habitat resulting from future maintenance of the modified channel in Brunswick Harbor. This approach avoids authorization of duplicate takes or impacts to ESA-managed resources already authorized in the 2020 SARBO, while ensuring that consultation on the entire action has been completed as required by ESA Section 7.”

Therefore, compliance section 7 of ESA is accomplished through the letter of concurrence for the new work and the 2020 SARBO.

NMFS in the LOC included a recommendation to contact the University of Delaware – College of Earth, Ocean, and Environment regarding their Real-Time Sturgeon Predictive model. This recommendation has been shared with the Corps’ South Atlantic Division SARBO team for their consideration.

- A Programmatic Agreement with GA HPD to comply with NHPA Section 106 (signed on October 14, 2020);
- Coordination of this EA and draft Finding of No Significant Impact (FONSI) with appropriate agencies, organizations, and individuals for their review and comments.
- All placement of material in the ODMDS is done in accordance with section 103 of the MRPSA. The Corps most recent concurrence from EPA for placement of material was received in a letter dated October 17, 2019. This concurrence is effective for a period of 3 years, at which time the Corps will seek new concurrence from EPA.

The draft FONSI will not be finalized and signed until the proposed action achieves environmental compliance with applicable laws and regulations, as described above.

7. Public Involvement and Review

7.1. Public Comments

A draft of the IFR/EA was released to the public for a 30-day review and comment period on June 9, 2020. Eleven comment letters were received during this period. Comments and the Corps responses to comments are found in Appendix F. Comments were received from the Catawaba Tribe's Tribal Historic Preservation Office, federal (USFWS, EPA, NMFS) and state agencies (GA- WRD, EPD, CRD and SHPO), the NFS (GPA), and two individuals. Tribal, federal and state agencies provided technical comments regarding the proposed action.

In addition to the Tribal, Federal, and State agencies technical comments, three supportive public comments were received. Supportive comments were received from GPA, the NFS, Harbor Pilot, and a private citizen. Supportive comments described the proposed work as substantially improving the versatility and efficiency of the Port, as well as helping ships to navigate through the sound towards the terminals of Brunswick and Colonel's Island.

On June 21, 2021, the Corps released a revised IFR/EA and draft FONSI for an additional 15-day comment period. Since release of the IFR/EA in June 9, 2020, the Corps has made revisions to the analysis and description of the O&M dredging to provide additional information regarding the incorporation of the 2020 SARBO requirements. In the furtherance of NEPA, the Corps provided the revised IFR/EA and draft FONSI for a 15-day public comment period.

7.2. Agencies Consulted

A Planning Charrette for the study was held on May 16-17, 2019. Representatives from GADNR, EPA, USFWS, NMFS, GPA, GADOT, and the USCG attended, either in person or via phone. Discussions were held on environmental topics such as beneficial use, environmental compliance issues, and preferred dredging methods. Subsequently, EPA, NMFS, USFWS, and GADNR were formally invited (emails dated May 23, 2019) to participate as cooperating agencies. GADNR and EPA officially accepted.

Under authority of the FWCA, the USFWS was requested to provide support in evaluating project goals, objectives, and management actions in the form of a Planning Aid Letter (PAL) or Planning Aid Report (PAR). A statement of work was provided to USFWS, and a draft report was provided to the Corps by USFWS on February 18, 2020. The final report was received May 20, 2020. The Corps responses to their final recommendations have been incorporated into Appendix K.

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), NMFS responded by letter dated July 8, 2020 and provided no conservation recommendations, therefore the substantive requirements of the MSA have been met.

Discussions with NMFS relating to compliance with Section 7 of the ESA were initiated in October 2019. Due to the routine and predicted effects (May Affect Not Likely to Adversely Affect - NLAA) anticipated from the location and prescribed construction of the project, an informal, expedited consultation was recommended. Consultation with the USFWS was completed June 18, 2020.

There was early coordination with EPA on the suitability for beneficial use and disposal of the sediments proposed for removal during project construction. EPA requested a summary of previous relevant sediment testing to aid in that determination. That summary was provided on November 13, 2019. Later, in November 2020, site-specific geotechnical samples were collected as part of the feasibility-level engineering design phase. In addition to physical characteristics needed for design, chemical constituents were analyzed as a condition of the project's GADNR-EPD October 2020 401 Water Quality Certification. Results of the analysis were shared with EPA and GADNR-EPD on February 25, 2021 and will be the basis from which beneficial use and disposal options will be decided.

The Corps initiated Section 106 of the NHPA coordination with the GA HPD and 11 Tribal Historic Preservation Officers (THPOs) on November 4, 2019. In the correspondence to the GA HPD and THPOs the Corps provided information regarding previous surveys, recorded cultural resources in the APE, nearby recorded cultural resources, and the types of impacts this undertaking would potentially have on cultural resources and historic properties. The Corps recommended execution of a PA as a way to fulfill its Section 106 compliance requirements.

The Corps notified the Advisory Council on Historic Preservation (ACHP) of its intent to prepare a PA on January 29, 2020. The ACHP declined to participate in consultation as the criteria for participation had not been met. A PA between the Corps and the GA HPD was executed on October 14, 2020 for this project (Appendix H). This agreement includes Phase I investigations to identify archaeological sites and shipwrecks in areas previously not surveyed where dredging will occur, including a buffer for mooring and anchoring and side-slopes. Any resources found during the surveys will be evaluated for inclusion on the NRHP. Mitigation would be required for NRHP-eligible resources if the project cannot avoid them. Previously recorded historic properties that might be impacted would be mitigated if avoidance is not possible. Surveys will be conducted to relocate the two anomalies in the turning basin, as well as diver investigations of the anomalies to determine if they are significant cultural resources.

None of the tribes expressed interest in being a consulting party for this undertaking or request concurring party status to the PA. The Catawba Indian Nation requested notification in the event of an inadvertent discovery.

Coastal Zone Management Act Coordination

On February 10, 2021, the Corps provided GADNR-CRD with a revised Coastal Zone Management Act (CZMA), Federal Consistency Review Determination. GA-DNR solicited public comments advertising the revised February 2021 Appendix J Federal

Consistency Determination and 2020 SARBO from March 12, 2021 to March 29, 2021 and received over 1,500 public comments. Every comment received opposed hopper dredging outside the previously authorized December 15 - March 31 winter dredge window, when sea turtle abundance is low, and that has been in place in Brunswick Harbor for over 30 years. Most comments cited increased impacts to sea turtles or other environmental damage and inconsistency with Georgia's state environmental laws and rules. GA-DNR CRD provided a conditional concurrence on April, 23 2021. The Corps objects to the conditions and has determined that the proposed action is fully consistent with the enforceable policies of the management program or, alternatively, that the proposed action is consistent to the maximum extent practicable with the enforceable policies of the management program. Section 6.0 provides a summary of the Corps compliance with CZMA and additional information can be found in Appendix J.

8. Recommendations

The following text outlines the Corps' recommendations for project approval and authorization for implementation.

To achieve the project objectives, I recommend implementation of Alternative 8 for modifications to the Brunswick Harbor Federal Navigation Project. Alternative 8 would consist of the expansion of a turning basin near Colonel's Island Terminal, the addition of a bend widener at Buoy 24 near the Cedar Hammock Range, and the addition of a vessel meeting area at St. Simons Sound. Alternative 8 includes dredging of the turning basin expansion and the bend widener to a depth equal to the existing Federal channel (-36 feet MLLW) with an estimated dredged volume of 551,000 cubic yards. Material would be disposed at Andrews Island DMCA. The meeting area at St. Simons Sound would take advantage of naturally deep water and would not require dredging.

Alternative 8 is the National Economic Development Plan. The average annual equivalent cost is \$637,000 while the average annual equivalent benefit is \$2,943,000. The recommended plan has \$2,306,000 in net benefits and a benefit-to-cost ratio of 4.6. The construction cost (project first cost) for Alternative 8 is \$13,804,000 (FY21). Implementation would be cost shared at a Federal contribution of \$9,084,000 and non-federal sponsor contribution of \$4,830,000.

The non-Federal sponsor, Georgia Ports Authority, supports this plan and there is no Locally Preferred Plan. It is anticipated that Georgia Ports Authority will be the non-Federal sponsor for the Preconstruction, Engineering, and Design phase, and for the Construction phase of the project.

My recommendation is subject to cost sharing, financing, and other applicable requirements of Federal and state laws and policies, including Section 101 of WRDA 1986, as amended. This recommendation is subject to the non-Federal sponsor agreeing to comply with all applicable Federal laws and policies including the following requirements prior to project implementation:

- a. Provide, during design and construction, respectively, funds necessary to make its total contribution for the design and construction costs of the general navigation features (GNFs) of the project;
- b. Provide all lands, easements, and rights-of-way (LER), including those required for relocations and dredged material placement facilities, acquire or compel the removal of obstructions, and perform or ensure the performance of all relocations, including utility relocations, as determined by the Federal government to be necessary for the construction, operation, and maintenance of the GNFs;
- c. Pay with interest, IAW applicable statutes, a portion of the total cost of construction of the GNFs less the amount of credit afforded by the Federal

government for the value of the LER and relocations, including utility relocations, provided by the non-Federal sponsor for the GNFs;

d. Provide 25 percent of the total cost of construction of the GNFs attributable to dredging to a depth in excess of -20 feet MLLW but not in excess of -50 feet MLLW;

f. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the GNFs, an additional amount equal to 10 percent of the total cost of construction of GNFs less the amount of credit afforded by the Federal government for the value of the LER and relocations, including utility relocations, provided by the Non-Federal sponsor for the GNFs. If the amount of credit afforded by the Federal government for the value of LER and relocations, including utility relocations, provided by the Non-Federal sponsor equals or exceeds 10 percent of the total cost of construction of the GNFs, the Non-Federal sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of LER and relocations, including utility relocations, in excess of 10 percent of the total costs of construction of the GNFs;

e. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project LER or the addition of facilities which might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function;

f. Construct, operate, and maintain, at no cost to the Federal government, the local service facilities, including obtaining all applicable licenses and permits necessary for construction, operation, and maintenance of such work;

g. Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon the LER that the non-Federal sponsor owns or controls for the purpose of operating, maintaining, repairing, rehabilitating, or replacing the project;

h. Hold and save the Federal government free from all damages arising from design, construction, and operation and maintenance of the project, except for damages due to the fault or negligence of the Federal government or its contractors;

i. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses for a minimum of three years after the final accounting and assure that such materials are reasonably available for examination, audit, or reproduction by the Federal government;

j. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601–9675;

k. Assume complete financial responsibility, as between the Federal government and the non-Federal sponsor, for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination, that are located in, on, or under lands, easements, and rights-of-way, including those required for relocations and dredged material placement facilities, that the Federal government determines to be required for the construction, operation, and maintenance of the project;

l. To the maximum extent practicable, perform its obligations related to the project in a manner that will not cause liability to arise under CERCLA;

m. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, (42 U.S.C. 1962d-5b) and Section 101(e) of the WRDA 1986, Public Law 99-662, as amended, (33 U.S.C. 2211(e));

n. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. 4601-4655) and the Uniform Regulations contained in 49 C.F.R. Part 24;

o. Comply with all applicable Federal laws and implementing regulations; and

p. Not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the non-Federal sponsor's obligations for the project unless the Federal agency providing the funds verifies in writing that the funds are authorized to be used for the project.

The recommendation contained herein reflects the information available at this time and current departmental policies governing formulation of individual projects. It does not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program or the perspective of higher review levels within the executive branch. Consequently, the recommendation may be modified before it is transmitted to the Congress as a proposal for authorization and implementation funding. However, prior to transmittal to the Congress, the State of Georgia, the Non-Federal sponsor (the Georgia Ports Authority), interested Federal agencies, and other parties will be advised of any significant modifications and will be afforded an opportunity to comment further.

Date

Joseph R. Geary, PhD, PE
Colonel, U.S. Army
Commanding

9. References

Automotive Logistics, "NYK to introduce world's largest PCTC powered by LNG," September 25, 2019. www.AutomotiveLogistics.media.

BATES-1998. Biological assessment of threatened and endangered species, Tybee Island, Georgia, Shoreline Protection Project, Beach Renourishment Evaluation Study
Bent, A.C. 1926. Life histories of North American Marsh Birds. U.S. Natural Museum Bulletin 135, 392 pp.

BATES USACE 2019. Biological assessment of threatened and endangered species, Tybee Island, Georgia, Shoreline Protection Project, Beach Renourishment Evaluation Study

Brooks. R.A., C.N. Purdy, S.S. Bell and K.J. Sulak. 2006. The benthic community of the eastern US continental shelf: a literature synopsis of benthic faunal resources. *Continental Shelf Research* 26: 804–818.

Childs, Curtis Winfred. 1966 History of Brunswick, Georgia. Unpublished Master's Thesis, Auburn University, Auburn, Alabama.

Delcourt, Hazel R., and Paul A. Delcourt. 1985. In: V. M. Bryant and R. G. Holloway (ed.). *Pollen Records of Late-Quaternary Sediments. Quaternary Palynology and Vegetational History of the Southeastern United States*, by pp. 1–37. American Association of Stratigraphic Palynologists Foundation.

Delcourt, Paul A., and Hazel R. Delcourt. 1981. R. Romans (ed). In *Geobotany. Vegetation Maps for Eastern North America: 40,000 years B.P. to Present*. Plenum Publishing, New York.

Dodd, M. 2003. Summary of strandings during I-beam operation in Brunswick Ship Channel, Brunswick, GA during winter/spring 2003. Georgia Department of Natural Resources, Brunswick, Georgia

Dompe, P. E. and D. M. Haynes. 1993. Turbidity Data: Hollywood Beach, Florida, January 1990 to April 1992. Coastal & Oceanographic Engineering Department, University of Florida: Gainesville. UF/COEL - 93/002.

EDGES 2019. DRAFT Wood Stork-Effects Determination Guidance for Endangered & Threatened Species (EDGES)

Emergency Permit Request for the Wreck of the Golden Ray- 21 January 2020, Pages 1-13.

Envirofacts. U.S. Environmental Protection Agency EnviroFacts Database: Several queries were made on the EPA EnviroFacts database, <https://www.epa.gov/enviro/topic/searches#land>

Environmental Protection Agency. 2013. Brunswick Harbor Ocean Dredged Disposal Site, Site Monitoring and Management Plan. Found at:
https://www.epa.gov/sites/production/files/2015-10/documents/region_4_brunswick_harbor_smmp_2013.pdf. Accessed on June 17, 2021.

EPD 1998. WQC- Brunswick Harbor/Channel Deepening for the USACE from GA Dept of Natural Resources- Environmental Protection Division- 03/24/98

ERDC 2019. Savannah River Harbor Cutterhead Dredging/Dissolved Oxygen Draft Project Report- September 2019, Prepared by : Matthew Balazik USACE ERDC

USACE, Engineer Research and Development Center (ERDC). 2020. Beaufort Inlet Channel Hopper Dredging/Turbidity Project Report, Morehead City, North Carolina. 7pp.

USACE, Engineer Research and Development Center (ERDC). 2020. Cape Fear River Channel Mechanical Clamshell Dredging/Dissolved Oxygen Project Report, Southport, North Carolina. 5 pp.

Espy, Huston & Associates, Inc.. 1991 Archaeological Remote-Sensing of Borrow Area I and a Proposed Groin Field, St. Simons Island Beach Renourishment Project Glynn County, Georgia. For the U.S. Army Corps of Engineers, Savannah District by Gulf Engineers & Consultants, Inc. Baton Rouge, Louisiana and Espy, Huston & Associates, Inc. Austin, Texas.

Fauchald, L. and P.A. Jumars. 1979. In: M. Barnes (ed.). Oceanography and Marine Biology An Annual Review. The diet of worms: a study of polychaete feeding guilds. Vol. 17. Aberdeen University Press.

GPA 2015. Georgia Ports Authority- IP Decision Document (SAS-2015-00443)

GPA MFR- Georgia Ports Authority, MFR - SAS-2015-00443

GA Beach bacteria report:

<https://coastalgadnr.org/sites/default/files/crd/BeachWQ/2020/glynnbeaches1.16.20.pdf>

GANSMP. The Georgia Aquatic Nuisance Species Management Plan and may be viewed at <http://www.georgiawildlife.com>

GADPH. GA Department of Public Health, Coastal Health District:

https://www.gachd.org/programs-services/environmental-health-2/beach_water_testing/

GA-DNR-georgia biodiversity:

https://georgiabiodiversity.a2hosted.com/natels/element_lists?area=cnty&group=all_groups&areacode=13127&areaname=Glynn%20County

GADNR 2020. Assessment of the demographic recovery criteria for the Northern Recovery Unit of loggerhead turtles (*Caretta caretta*) using genetic mark-recapture including implementation of high priority recovery actions.” Grant Number: NA16NMF4720076. Project Duration: July 1, 2016 – June 30, 2020).

Garrison, Ervan G. 1980. An Archival Study of Shipwrecks in the Vicinity of Savannah and Brunswick Harbors, Georgia. For the U.S. Army Corps of Engineers, Savannah District.

Garrison, Ervan G., and David R. Evans. 1980 A Magnetometer Survey of Selected Reaches of Savannah and Brunswick Harbors, Georgia. For the U.S. Army Corps of Engineers, Savannah District.

Georgia DNR Sea Turtle Conservation Program-
<http://www.seaturtle.org/nestdb/index.shtml?view=3&year=2019>

Georgia- CRD. USACE email communication- 03/26/20

IPAC. <http://ecos.fws.gov/ipac/http://ecos.fws.gov/ipac/>

Griffin, J.B. 1943. In: Bureau of American Ethnology Bulletin. An Analysis and Interpretation of the Ceramic Remains from Two Sites near Beaufort County, South Carolina. Bulletin 133:155–168.

James, Stephen R., Jr. 2008. Remote Sensing Survey Data Analysis and Diver Investigations, Brunswick Harbor, Glynn County, Georgia. Prepared by Panamerican Consultants, Inc., Memphis, Tennessee. Under subcontract to New South Associates, Inc., Stone Mountain, Georgia. Contract No. W912HN-05-D-0014. Prepared for U.S. Army Corps of Engineers, Savannah District.

[LTMS](#). Savannah Harbor Long Term Management Strategy- 1996

NMFS 2020. National Marine Fisheries Service Consultation letter- received on July 8, 2020.

NMFS 2021. NMFS Reinitiation of Endangered Species Act (ESA) Section 7 Consultation on the Implementation of the Sea Turtle Conservation Regulations under the ESA and the Authorization of the Southeast U.S. Shrimp Fisheries in Federal Waters under the Magnuson-Stevens Fishery Management and Conservation Act (MSFMCA), NMFS Tracking Number SERO-2021-00087

NOAA Whale. <https://www.fisheries.noaa.gov/species/north-atlantic-right-whale>
NOAA Sturgeon. <https://www.fisheries.noaa.gov/species/shortnose-sturgeon>
NOAA EFH. <http://www.habitat.noaa.gov/efh>

NOAA MMPA. <https://www.fisheries.noaa.gov/topic/laws-policies#marine-mammal-protection-act> Post- SCDNR- USACE email communication-03/20/20

SAFMC, 2020- <https://safmc.net/download/SAFMCEFHUsersGuideNov20.pdf>- “Users Guide to Essential Fish Habitat Designations by the South Atlantic Fishery Management Council, Revised November 2020”

Sanger, D., and C. Parker. 2016. Guide to the Salt Marshes and Tidal Creeks of the the Southeastern United States. Marine Resources Research Institute. Accessed from saltmarshguides.org on May 28, 2021.

Sassaman, Kenneth E. 1993. Early Pottery in the Southeast. Tradition and Innovation in Cooking Technology. University of Alabama Press, Tuscaloosa, Alabama.

Species List.

<https://nas.er.usgs.gov/queries/SpeciesList.aspx?Group=&Status=0&FMB=0&pathway=0&Sortby=1&Size=50&HUCNumber=3>

SAFMC 1998. South Atlantic Fishery Management Council 1998. Habitat Plan for the South Atlantic Region: Essential Fish Habitat Requirements for Fishery Management Plans of the South Atlantic Fishery Management Council The Shrimp Fishery Management Plan, The Red Drum Fishery Management Plan, The Snapper Grouper Fishery Management Plan, The Coastal Migratory Pelagics Fishery Management Plans, The Golden Crab Fishery Management Plan, The Spiny Lobster Fishery Management Plan, The Coral, Coral Reefs, and Live/Hard Bottom Habitat Fishery Management Plan, The Sargassum Habitat Fishery Management Plan, and The Calico Scallop Fishery Management Plan. South Atlantic Fishery Management Council. Charleston, SC. 457 pp.

SERIM- Southeast Regional Implementation Manual- August 2008

SHEP-EIS 2012. SHEP 2012 Tybee Environmental Impact Statement

Testing Manual- Evaluation of Dredged Material Proposed for Ocean Disposal- February 1991

Tidewater Atlantic Research. 1992 A Submerged Cultural Resource Survey of Proposed Offshore Borrow Areas for the Glynn County Beach Renourishment Project Glynn County, Georgia. For the U.S. Army Corps of Engineers, Savannah District. By Gulf Engineers and Consultants, Inc. Baton Rouge, Louisiana and Tidewater Atlantic Research, Washington, North Carolina.

Tuttle, Michael C., and Stephen R. James, Jr. 1999 Remote Sensing Survey, Brunswick Harbor Deepening Project, Glynn County, Georgia. Prepared for U.S. Army Corps of Engineers, Savannah District. By Panamerican Consultants, Inc., Memphis, Tennessee.

USACE 2015. Engineering Manual 1110-2-5025 Dredging and Dredged Material Management. U.S. Army Corps of Engineers (USACE), Washington, D.C., July 31,

2015.USACE 1998. U.S. Army Corps of Engineers (USACE). 1998. Final Environmental Assessment Tybee Island Oceanfront Beach Second Street Study, Tybee Island, Georgia.

USACE 2019b. Savannah River Harbor cutterhead dredging dissolved oxygen draft project report: Monitoring the effects of hydraulic-cutterhead dredging on dissolved oxygen in the Savannah River Harbor. U.S. Department of Defense, Army Corps of Engineers, Engineer Research and Development Center.

USACE-SAS, May 1998, APPENDIX D – Dredge Material Management Plan. *Brunswick Harbor Deepening Feasibility Study* (pp. 1–74). Brunswick, Georgia.

United States Army. 1876 Annual Report of the Chief of Engineers, United States Army, to the Secretary of War for the Year 1876. Government Printing Office, Washington D.C.

United States Army. 1880 Annual Report of the Chief of Engineers, United States Army, to the Secretary of War for the Year 1880. Government Printing Office, Washington D.C.

United States Army. 1883 Annual Report of the Chief of Engineers, United States Army, to the Secretary of War for the Year 1883. Government Printing Office, Washington D.C.

U.S. Army Corps of Engineers (USACE). 2001. App A- 4.0 ENVIRONMENTAL SETTING , Essential Fish Habitat (EFH) Assessment For Modifications to the Brunswick Harbor Deepening Project, Glynn County, Georgia.

U.S. Army Corps of Engineers (USACE). Revised 2012. 5.00 FINAL ENVIRONMENTAL IMPACT STATEMENT- Savannah Harbor Expansion Project, Chatham County, Georgia and Jasper County, South Carolina.

Van Dolah et al., 1984. Van Dolah, R.F., Calder, D.R., Knott, D.M. Effects of dredging and open water disposal on benthic macroinvertebrates in a South Carolina Estuary.

Water Quality. <https://www.grc.nasa.gov/WWW/k-12/fenlewis/Waterquality.html>

Watts, Gordon P., Jr. Alvin Banguilan, Sarah Cole, Wendy Puckett, Kelsey Noack Myers, Robin Arnold, Gianna Gandossi, and Robert Bowman. 2017. A Phase I Remote-Sensing Archaeological Survey in Noyes Cut and Dynamite Cut and a Low Water Visual Survey of Noyes Cut, Dynamite Cut and Old River Run Satilla River Estuary, Camden County, Georgia. Contract W912HN-15-D-0023 Delivery Order W912HN-17-F-5000 LG2ES Project Number 2017-237. Prepared for U.S. Army Corps of Engineers, Savannah District. Report on file with Georgia Archaeological Site File, Athens, Georgia.

Wetlands Mapper. <https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/>

Wood, J. n.d. The Georgia Shipwreck Index and Vessel File.

