US Army Corps
of Engineers ®
Wilmington District

BOEM
Bureau of Ocean Energy
Management

DRAFT ENVIRONMENTAL ASSESSMENT

for

Wrightsville Beach Coastal Storm Risk Management

Emergency Repair – Evaluation of Borrow Area Alternatives

New Hanover County, North Carolina

January 2023

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1 INTRODUCTION

The subject of this Environmental Assessment (EA) is the evaluation of borrow area alternatives supporting the one-time emergency repair (renourishment) of the existing Wrightsville Beach Coastal Storm Risk Management (CSRM) Project. The U.S. Army Corps of Engineers Wilmington District (USACE) is the lead federal agency for the National Environmental Policy Act (NEPA) process and associated environmental compliance activities. Pursuant to 40 CFR 1501, the Bureau of Ocean Energy Management (BOEM) is serving as a cooperating agency as the proposed action is to utilize two potential offshore borrow areas that occur within both state and federal waters offshore of the south end of Wrightsville Beach. Since BOEM has jurisdiction, by law, over mineral leasing in the Outer Continental Shelf (OCS) beyond three miles, this EA will also support BOEM's decision regarding issuance of leases for those portions of the identified borrow areas outside the three-mile limit. BOEM will also serve as a cooperating agency for consultation requirements related to Endangered Species Act (ESA) Section 7 (50 CFR 402), National Historic Preservation Act (NHPA) Section 106 (36 CFR 800), Subpart C Consistency (15 CFR 930), and Magnusson-Stevens Section 305 (50 CFR 600).

The purpose of this EA is to evaluate the environmental consequences of the different borrow area alternatives and to ensure that environmental and project information is available to the public in the context of the proposed action. Much of the project and its impacts, including activities associated with both beach placement and dredging of borrow areas, have been evaluated in previous NEPA documents (Section 1.4). The most relevant EA and Finding of No Significant Impact (FONSI) associated with the recent validation study was published in 2019 and is hereby incorporated by reference. Therefore only new information and any changes related to the offshore borrow alternatives not previously considered will be covered in this EA. These changes include refined borrow area information and, adoption of the updated National Marine Fisheries Service's (NMFS) 2020 South Atlantic Regional Biological Opinion (SARBO), and implementation of relevant SARBO Project Design Criteria (https://media.fisheries.noaa.gov/dam-migration/sarbo_acoustic_revision_6-2-2020-opinion_final.pdf). The 2020 SARBO provides the authority for the Corps to conduct project related dredging and placement activities and for BOEM to authorize use of OCS sediment to support the project in accordance with Section 7 of the Endangered Species Act (ESA). This EA has been prepared in accordance with the NEPA, the Council on Environmental Quality regulations (40 Code of Federal Regulations (CFR) parts 1500 - 1508,1515 - 1518) recently updated in 2022, and Engineer Regulation (ER) 200-2-2.

1.1 Authorization

The Wrightsville Beach Coastal Storm Risk Management project is authorized by the Flood Control Act of 1962, Water Resources Development Act (WRDA) of 1986, and Water Resources Development Act of 2020. The 2020 Wrightsville Beach Validation report was authorized to allow an increase in the total maximum/Section 902 project cost limit, so Federal participation in periodic renourishment could continue through FY

2036 (Section 1.4). Emergency restoration is authorized by Public Law 84-99 (PL 84-99), Emergency Response to Natural Disasters. BOEM is authorized under Public Law 103-426 [43 United States Code (U.S.C.) 1337(k)(2)] to negotiate on a non-competitive basis the rights to OCS sand resources for shore protection projects. BOEM's proposed connected action is to issue a negotiated agreement authorizing use of sand resources located in federal waters.

1.2 Background

Wrightsville Beach is located in New Hanover County in southeastern North Carolina adjacent to the Atlantic Ocean. The existing authorized CSRM project consists of a dune with a base generally bordering at or near the building line together with an integral shoreline berm for a total distance of 15,650 feet, which includes a 2,000-foot northern transition. The originally authorized borrow source providing sand for both initial construction and subsequent nourishment intervals through 2018 is located within Masonboro Inlet.

Initial construction of the Wrightsville Beach CSRM project was completed in 1965, as authorized by the Flood Control Act of 1962. The project was reauthorized for 50 years (ending in 2036) pursuant to PL 87-874 as published in House Document 511, 87th Congress, 2nd Session and the Water Resources Development Act of 1986 (PL 99-662). To date, eight CSRM periodic renourishment events (1991, 1994, 1998, 2002, 2006, 2010, 2014 and 2018) have been completed since the 1986 authorization, each utilizing sediment dredged from the originally authorized Masonboro Inlet borrow area (Figure 1). The most recent 2019 Wrightsville Beach Validation report was authorized to allow an increase in the total maximum/Section 902 project cost limit, so Federal participation in periodic renourishment could continue through FY 2036. Based on the findings of this report, a periodic renourishment was planned for FY 2022 utilizing sediment from the Masonboro Inlet borrow area with the option for using offshore borrow areas to support future nourishments if needed. The Masonboro Inlet borrow area is located within Coastal Barrier Resources System (CBRS) Unit L09 as defined in the Coastal Barrier Resources Act (CBRA) (16 U.S.C § 3501 et seq). The Corps previously concluded that use of the borrow area was consistent with the purpose of CBRA based on the US Department of Interior Office of the Solicitor interpretation of Section 6(a)(6)(G) of the CBRA permitting Federal funding for using sand removed from within the System to support shoreline stabilization projects located outside the System. On July 14, 2021, after publication of the 2019 validation report and EA/FONSI, the US Department of Interior Office of the Solicitor reversed their prior 2019 interpretation of the CBRA's statutory text and reinstituted their interpretation that the exemption in Section 6 (a)(6)(G) applies only to projects designed to stabilize shorelines located within the system; thus, removal of sand from within CBRS Unit L09 (Masonboro Inlet borrow area) could not be used to support construction of the authorized Wrightsville Beach project template located outside of the CBRS. Based on this revised interpretation, the Corps concluded that continued use of the historic authorized borrow source located in Masonboro Inlet for placement in the authorized project area would not be consistent with the purpose of CBRA. Therefore, the search for new offshore borrow area alternatives delayed the planned periodic renourishment to FY 2023.

In 2019, Hurricane Dorian caused significant sand loss to Wrightsville Beach, ultimately resulting in the need for emergency repair as authorized by PL 84-99. The emergency repair will restore the Wrightsville Beach CSRM project template, to the same extent as a periodic renourishment. Including the emergency repair planned for 2023, a total of four more renourishment events, once every four years, are planned in accordance with the 2019 Validation Report. Since this EA only addresses the emergency repair to be accomplished in 2023, a second EA will subsequently be completed to analyze the remaining three renourishment cycles of Wrightsville Beach to the end of its project life of 2036. In accordance with NEPA regulations (40 CFR § 1502.14), this EA considers and evaluates the environmental impacts of the proposed borrow area alternatives in the context of new information or changes not previously considered since publication of the 2019 EA/FONSI. Though the Corps has concluded that dredging of sand from within the Masonboro Inlet borrow area for the purpose of constructing this one-time emergency repair is not exempt under Section 6 (a)(6)(G) and its use would not be consistent with the purpose of CBRA, the Masonboro Inlet borrow area is included in this NEPA analysis for the purpose of comparing environmental impacts across alternatives.

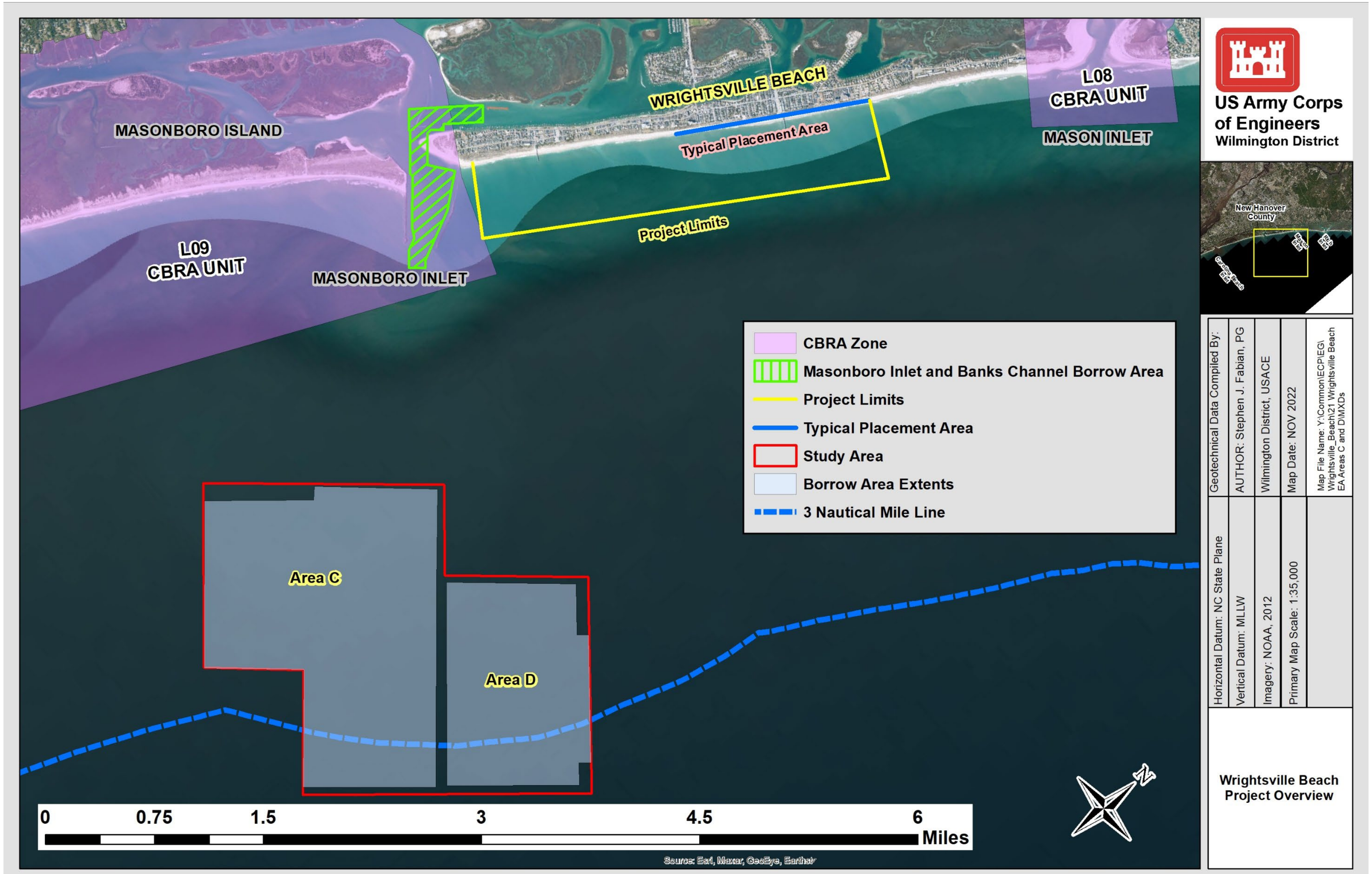

Figure 1 Wrightsville Beach CSRM Project Overview

1.3 Purpose and Need for Action

The purpose of the USACE's federal action is to conduct one-time emergency repairs utilizing a viable borrow source that contains the required volume of beach quality sand to repair the authorized Wrightsville Beach CSRM project. In 2019, the USACE completed the Integrated Validation Study Report and Environmental Assessment for the Wrightsville Beach, NC, Coastal Storm Risk Management Project, New Hanover County, North Carolina. (Final Wrightsville Beach, NC, Validation Study, November 2019). The project was authorized pursuant to the Validation Study in 2020, and included the continuation of Federal participation in periodic renourishments through 2036 utilizing Masonboro Inlet and a portion of Banks Channel as the approved borrow source.

The last periodic renourishment was completed in March 2018 and the next renourishment event was scheduled for FY 2022. However, as previously discussed, Masonboro Inlet and a portion of Banks Channel are located within the Coastal Barrier Resources System Unit L09 (Figure 1). In accordance with a November 2019 Solicitor's opinion, the US Department of the Interior (USDoI) issued a revised determination that utilization of sand from within a Coastal Barrier Resources System (CBRS) unit to nourish a beach outside the unit was consistent with the purpose of CBRA based on specific exemption (16 U.S.C. § 3505(a)(6)(G)). However, on July 15, 2021, the USDoI vacated that 2019 opinion and reinstated its earlier interpretation under the Coastal Barrier Resources Act that the exemption in Section 6 (a)(6)(G) applies only to projects designed to stabilize shorelines located within the system.

On August 5, 2021, the US Fish and Wildlife Service (USFWS) notified USACE that "the CBRA exception under 16 U.S.C. § 3505(a)(6)(G) for 'nonstructural projects for shoreline stabilization that are designed to mimic, enhance, or restore a natural stabilization system **cannot** be applied to removal of sand from within the CBRS to support beach nourishment projects that occur outside of the CBRS." As a result, the renourishment scheduled for FY 2022 was delayed pending the authorization of an alternate borrow source to conduct emergency repairs.

As described in detail in Appendix A, the Corps conducted a detailed review of the historic literature and associated data in order to describe the underlying geologic framework offshore of Wrightsville Beach and identify opportunities for new offshore sand resource alternatives. Based on an extensive analysis of the offshore geology, the District narrowed the scope of its offshore borrow investigation to two alternatives (borrow areas C &D) located within both state and federal waters offshore the south end of Wrightsville Beach. Detailed discussion of this offshore borrow area investigation and the process leading to the identification of borrow areas C and D is provided in Appendix A. BOEM is authorized under Public Law 103-426 [43 United States Code (U.S.C.) 1337(k)(2)] to negotiate on a non-competitive basis the rights to OCS sand resources for shore protection projects. Therefore, BOEM's potential connected federal action is to issue a non-competitive negotiated agreement (NNA) authorizing use of the identified OCS sand source areas located within borrow areas C and D at the request of the Corps and the Town of Wrightsville Beach (Figure 1).

1.4 Incorporation by Reference

USACE has conducted a number of prior studies regarding the Wrightsville Beach area and has prepared a number of related engineering, planning, and environmental reports. These studies have addressed coastal storm risk management, as well as navigation needs and are listed below.

- 1980 Wrightsville Beach Section 111 Report
- 1982 Wrightsville Beach Shore and Hurricane Wave Protection EA/Finding of No Significant Impact (FONSI) (Revised 1983)
- 1989 Wrightsville Beach Renourishment Report and Supplement to the EA/FONSI
- 1997 Channel Realignment Maintenance Dredging for Masonboro Inlet EA/FONSI
- Wrightsville Beach, NC Validation Study, November 2019 (included an EA/FONSI)

2 ALTERNATIVES

This section evaluates the potential environmental consequences associated with three alternatives to accomplish the purpose and need of the proposed project including: (1) (No action) no emergency repair, (2) (proposed action) emergency repair using offshore borrow areas, and (3) emergency repair using the Masonboro Inlet borrow area. Both the offshore and Masonboro Inlet borrow area alternatives described below contain the volume of beach quality sand (approximately 1,200,000 CY dredged and approximately 1,000,000 CY placed) required to conduct a one-time emergency repair of the following Wrightsville Beach CSRM project features: Dune having a crown width of 25 feet at 12.5 feet NAVD88, together with a storm berm, having a crown width of 50 feet at 9.5 feet NAVD88, and a construction berm, having a variable crown width that has historically averaged around 200feet at 5.0 feet NAVD88. To ultimately get approximately 1,000,00 CY of sand on the beach, approximately 1,200,000 CY must be dredged from the borrow area to account for material lost during dredging and placement. The dune and berms extend north 13,650 feet from Masonboro Inlet North Jetty. Historically the typical project renourishment extends from Station 70+00 to 140+00 with a 2,000-foot transition to station 160+00, for a total length of 15,560 feet. The Proposed Plan includes placement of material along the beachfront at Wrightsville Beach, NC within the authorized template (Figure 1).

Recognizing that there are unique differences (e.g., sea state, distance to placement, borrow area design, etc.) in the dredging environments associated with each borrow area alternative, different dredging and related ancillary equipment may be used with the potential for uniquely different impact producing factors. Detailed descriptions of the different equipment types and related operating parameters (e.g., hydraulic cutterhead dredge, trailing suction hopper dredge, sea turtle relocation trawling, etc.) that may be associated with each alternative, including their related impact producing factors, are provided in SARBO 2020 and incorporated by reference. These activities and related impact producing factors are the basis of the comparison of effects among alternatives.

Prior nourishment events involved dredging from the Masonboro Inlet borrow area using a hydraulic cutterhead dredge with direct conveyance of sediment from the borrow area to the placement site via pipeline. Therefore, for the purpose of this EA, it is assumed that emergency repair using the Masonboro Inlet borrow area would be conducted using a hydraulic cutterhead dredge. Either an ocean certified hydraulic cutterhead dredge or trailing suction hopper dredge could be used to dredge the offshore borrow area alternative; thus, both options are considered in the analysis. If trailing suction hopper dredge(s) are used, additional impact-producing factors related to the pipeline corridor, transiting to and from the pumpout, etc. may be considered depending on the resource category analyzed. Additionally, in accordance with the SARBO, sea turtle relocation trawlers may be required as a tool to mitigate risk of entrainment to sea turtles by the trailing suction hopper dredge. The use of relocation trawlers is a connected activity in association with the offshore borrow area for the purpose of this analysis.

2.1 Alternative 1 (No Action) – No Emergency Repair

Alternative 1, the No Action alternative, is to **not** conduct emergency repair of the Wrightsville Beach CSRM project. This alternative would allow the continued erosion of sand within the CSRM project area, increasing risks of storm damage until the next renourishment.

2.2 Alternative 2 (Proposed Action) – Emergency Repair Using Offshore Borrow Areas

Alternative 2, the Proposed Action, would accomplish a one-time emergency repair to the Wrightsville Beach CSRM project by placing approximately 1,000,000 cubic yards of beach quality sand on the beach from the portion of the offshore borrow area shown in Figure 1. BOEM would issue a non-competitive negotiated agreement (NNA) authorizing use of borrow areas located in the OCS at the request of the Corps and the Town of Wrightsville Beach.

Various dredge types may be used for the emergency repair and may include hopper dredges, hydraulic cutterhead dredges or mechanical dredges. Although the use of a mechanical dredge is not excluded for this project, it is highly unlikely that one would be used for the project due to the requirement for the vessel to be ocean certified, so it may safely handle rough sea conditions. Depending on regional incidental sea turtle take numbers at the time of operations and the risk of project specific take, relocation trawling may be required as a component of offshore borrow hopper dredging operations.

The beach quality material could be dredged by one hopper, which would be anticipated to take an estimated 110 days; if two hopper dredges are used concurrently, then it would take an estimated 55 days (total). When a hopper attains a full load, dredging would stop and the dredge would travel to a pump-out station (anchored approximately 2,500 to 3,000 feet offshore) where the dredged material would be pumped onto the beach through a submerged pipeline. Material would then be shaped on the beach by earth-moving equipment. During placement, material between the toe of the dune and the mean high water line may be tilled, if required, to minimize compaction. The Wilmington District traditionally accomplishes all hopper dredging during the coldest water months from December 1 to March 31 due to historically high sea turtle abundance and bird nesting concerns.

If a hydraulic cutterhead dredge is used, material would be pumped through a pipe from the borrow area directly onto the beach. Use of a hydraulic cutterhead dredge would take approximately 50 days. Hydraulic cutterhead dredging would be conducted within the timeframe of November 16 through April 30 to reduce the risk to nesting sea turtles and birds. No matter what type of dredge accomplishes the repair work, the contractor will be required to maintain a minimum of one dredge diligently working until the repair is completed.

2.2.1 Borrow Area Investigations

Since 1939, Wrightsville Beach has been one of the most-replenished beaches on the

U.S. East Coast, and has been funded under the widest variety of federal authorizations of any beach in the United States. These include: 1) Flood Control; 2) Emergency; 3) Flood Control and Navigation; and 4) Mitigation of the Effects on Navigation. Since initial construction of the federal project in 1966, Wrightsville Beach has utilized the Masonboro Inlet and Banks Channel borrow site, which lies within two federally authorized navigation channels. Based on the Department of Interior current interpretation of CBRA, the Corps concluded that continued use of the historic authorized borrow source located in Masonboro Inlet for placement in the authorized project area would no longer be consistent with the purpose of CBRA.

Reconnaissance subsurface investigations using a combination of boring data and geophysical surveys were used to define the offshore geology and identify viable borrow area alternatives to support one-time emergency construction of the Wrightsville Beach CSRM project (Appendix A). Hundreds of miles of historic geophysical data coupled with collection of 496 vibracores were utilized to identify potential offshore borrow area alternatives. These historic data were used to inform subsequent reconnaissance, geotechnical and geophysical survey investments in targeted regions. A total of six potential sand resource alternatives were identified. From 2019-2022, 338 vibracores were collected offshore and discovered five potential sand resources: Area B, C, D, E, and F (Figure 2). Each of these five areas collected enough geotechnical information to delineate suitable and non-suitable areas for dredging from a geotechnical perspective. Once the sand resources were identified additional screening measures were performed on each of the areas to determine which areas could be considered for dredging. These screening measures included: performing STWave Model run, presence in a CBRS, grain size, and distance from shore. Area B was screened out following the STWave Model results, which indicated shoreline impacts to Masonboro Island and Wrightsville Beach following dredging. In addition, the bulk of Area B's volume was present in CBRS and could not be used. Therefore, Area B was no longer considered a viable option. Areas C, D, E, and F showed no impacts while being analyzed in the STWave Model and were well outside the CBRS and thus carried forward for analysis. The grain size summary of each borrow area indicated extensive beach compatible material. Areas C, D, E, and F were then brought to the final screening measure, distance from shore. Most of area C and D were within three nautical miles and provided isopach volumes of 12 million cubic yards. While Area E and F provided significant isopach volumes of 15 million they were both beyond three nautical miles and would increase construction costs significantly. Therefore, Areas C and D were then combined to one general study area to where a cultural resource survey was carried forward to identity cultural resources (Figure 2). Additional details regarding the geotechnical information within Areas C and D can be found in Appendix A.

As a component of this design level data acquisition, the USACE contracted with Geodynamics to perform thorough hydrographic, sidescan and magnetometer/gradiometer surveys within borrow areas C & D (Appendix B) to identify any potentially significant submerged cultural resources or hard bottoms. Specifically regarding cultural resources, Geodynamics contracted with Tidewater Atlantic

Research (TAR) of Washington, North Carolina, to analyze and interpret the surveys' magnetic and acoustic remote-sensing data and to generate a report summarizing their findings (Appendix C).

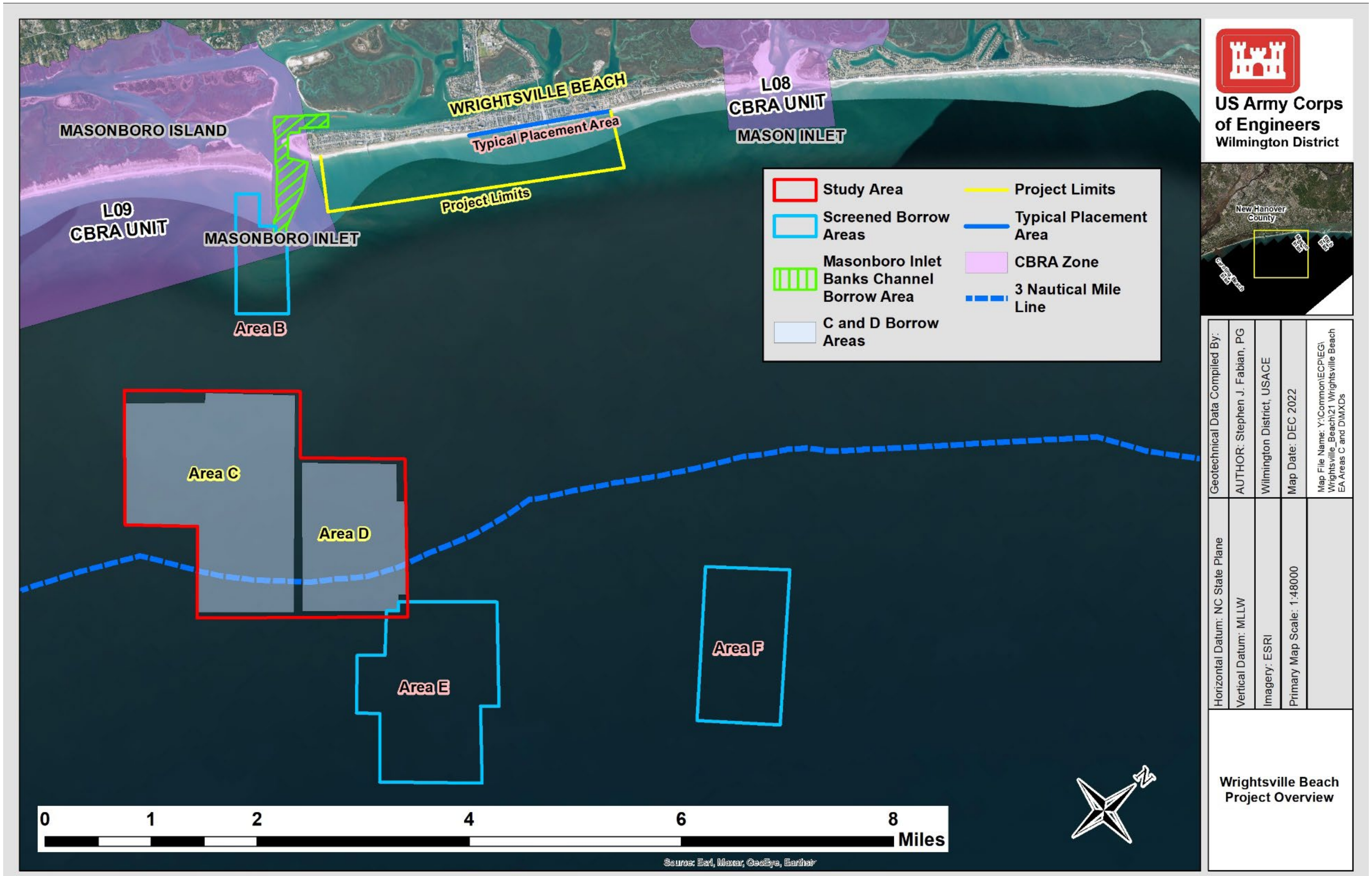

Figure 2. Borrow Area Locations

Analysis of the side scan sonar data obtained by Geodynamics (Appendix B) identified thousands of tires (labeled “Side-Scan Contacts”) in the area surveyed (Figure 3). Based on historical research, approximately 650,000 un-ballasted tires and other materials were deployed by the North Carolina Division of Marine Fisheries in the 1970s and 1980s to create a system of artificial reefs in North Carolina’s ocean waters. The reef in closest proximity to the borrow source is known as AR-370 and is located to the northwest of the borrow site (Figure 3). In addition to tires, AR-370 also contains materials such as concrete pipe sections and sunken vessels / barges. It is speculated that over several decades the steel cable, nylon rope, and polypropylene rope that bound tires together have deteriorated and failed. Storms and natural currents have swept these tires and binding materials well outside of the AR-370 vicinity and have redistributed orphaned tires over much of the borrow site. In conjunction with the side scan sonar survey, a magnetometer/gradiometer survey was performed across the proposed borrow area. In addition to the tires, TAR also identified approximately 1,700 magnetic anomalies along with the tires strewn across the site (Appendix C). Virtually all magnetic anomalies were characterized by low-intensity short-duration signatures that do not appear to have an association with potentially significant submerged cultural resources. These magnetic anomalies are thought to be remnants of steel cable used in construction of AR-370. The TAR report concluded, "Based on both the acoustic targets and magnetic anomalies in the remote sensing data, those areas do not contain signatures that appear to represent potentially significant submerged cultural resources. As a consequence, no additional investigation or avoidance sites are recommended.”

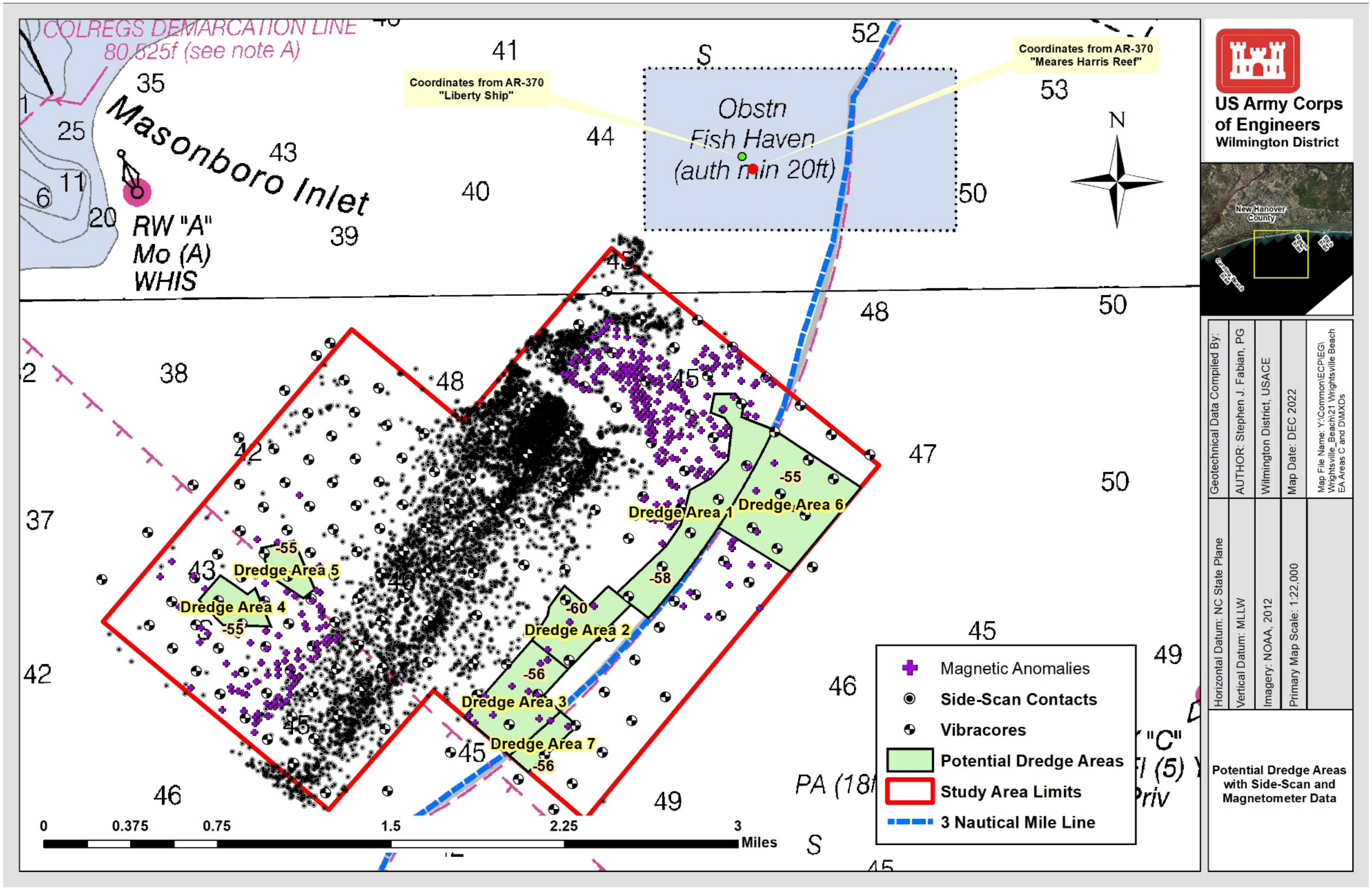

Figure 3. Side Scan and Magnetometer Data, Offshore Borrow Study Area

Concentrations of tires and magnetic anomalies formerly associated with the artificial reef AR-370 render much of the potential borrow site unusable; however, the USACE has identified suitable areas of the borrow site for the proposed repair that will minimize encounters with debris and provide adequate beach quality material to complete the emergency repairs (renourishment). The USACE intends to use portions of the borrow site that appear to have no tires on the surface and minimal subsurface magnetic anomalies.

The area planned to be dredged for the FY23 repair is within the green shaded area identified in Figure 3. The green shaded area was further divided into seven different areas. Dredge area 6 and 7 are in federal waters, and use of that area for borrow material would require a non-competitive negotiated agreement (NNA) with the Bureau of Ocean Energy Management (BOEM). The USACE is coordinating the emergency repairs with BOEM; however, if approval to dredge in federal waters is not obtained in time for the FY23 repairs, the portion of the borrow area identified for use, as described above, within state water's contains sufficient volume to meet the one-time repair demand (Table 1).

Table 1. Estimated Volumes in Each Dredge Zone

Borrow Area Zone	Estimated Placed Volume (CY)	Estimated Dredged Volume (CY)
Zone 1	955,000	1,146,000
Zone 2	555,000	666,000
Zone 3	530,000	636,000
Zone 4	315,000	378,000
Zone 5	195,000	234,000
Zone 6	1,180,000	1,416,000
Zone 7	185,000	222,000
Within State Waters Total	2,550,000	3,060,000
Within Federal Waters Total	1,365,000	1,638,000
Within State and Federal Waters Total	3,915,000	4,698,000

As part of the borrow area use plan, the contractor will recover the maximum amount of beach quality sand within one portion of the borrow area using a two-foot buffer (i.e., leaving approximately two feet of sand on the bottom) before relocating to another area within the borrow area. Maximum recovery of material shall be determined by dredging equipment efficiencies, entrainment of unsuitable material, or the maximum dredging depth determined by the government, whichever depth is less. The proposed emergency repair will be a one-time action, planned for FY23 and will require an estimated 1,000,000 cubic yards of placed material (1,200,000 CY dredged). Dredged volumes are adjusted by approximately 20% to account for overfill and other loss during dredging and placement.

2.2.2 Borrow Area Mitigation Plan

Placement of beach quality sand would be accomplished by pumping a mixture of beach quality sand and water (slurry) through a pipeline from the dredge to the recipient beach. Beach placement operations typically employ a spreader that would be attached to the discharge end of the pipeline. Spreaders are designed to slow the velocity of the discharge slurry to prevent erosion and to facilitate sediment settling. Temporary shore-parallel containment dikes would be constructed in front of the onshore beach discharge points to facilitate sediment settling and to reduce turbidity in the nearshore environment. As placement activities progress, the onshore pipeline would be extended along the beach by adding new sections of pipe. Pipeline placement is typically on the upper beach, but seaward of the dunes and any upper beach vegetation. Booster pumps may be required along the pipeline as it is extended along the beach. The location where the pipeline emerges onto the subaerial beach may also shift incrementally as the repair progresses along the beach. Throughout the repair process, front-end loaders or other heavy equipment would be used to transport and position the onshore pipeline sections.

Emergency repairs of the Wrightsville Beach CSRM project may be accomplished by a hopper dredge with a hopper pump-out station with direct placement on the beach or by a hydraulic cutterhead dredge with direct placement on the beach. The hopper dredge would pump the material out of the hopper via a pumpout station approximately 2,500 to 3,000 ft. offshore and a submerged pipeline would approach the beach at a given area and extend to the placement area. As described below, depending on the dredge plant employed, the USACE will implement several measures with the purpose to avoid and minimize the placement of tires or other borrow area debris on the beach.

Hopper Dredge: Any work done with a hopper dredge would incorporate screens, as described below, at three different locations to prevent the placement of tires or pieces of tires and borrow area debris on the beach. All hopper screening measures will be coordinated with NMFS through the Supersede review process as outlined in Section 2.5.2.2 and 2.9.3.5.1 of the 2020 SARBO. The 2020 SARBO is available for reference on the NMFS website at: https://www.fisheries.noaa.gov/content/endangered-species-act-section-7-biological-opinions-southeast.

1) A 4”X4” screen attached to the underside of the draghead. A screen at this location will substantially reduce the number of tires/debris suctioned by the dredge.

2) A 4”X4” screen installed on the hopper inflow boxes. Screens on the inflow boxes will capture debris that surpassed the screen on the draghead, further reducing debris in the dredged material. Debris collected inside the inflow boxes will be collected and disposed of properly in an approved landfill or recycling center.

3) A 2”X2” screen at the end of the discharge pipe on the beach. The smallest screen sized opening will be attached to the end of the discharge pipe on the

beach to capture tire pieces or debris that made it past the first two screens. Debris collected inside the inflow boxes will be collected and disposed of properly in an approved landfill or recycling center.

The proposed use of additional and finer screens to avoid tires and debris on the beach may reduce the ability of Protected Species Observers (PSO)s to accurately monitor potential take. However, this constraint was considered and analyzed in SARBO and reflected in the incidental take analysis. Visual observers would be stationed at the inflow box and on the beach to quickly identify and remove unacceptable material. All debris will be discarded in an on-site dumpster (on the dredge and on the beach) and disposed of at an approved off-site disposal facility. Additionally, the USACE will frequently inspect operations on the beach to monitor the quality of material being transported to the beach and take action as necessary to address any concerns with the quality of material being placed.

Hydraulic Cutterhead Dredge: Any work done with a hydraulic cutterhead dredge will incorporate screens at the following two locations.

1) A 4"X4" screen attached in front of the hydraulic cutterhead suction. This will substantially reduce the number of tires/debris sucked up by the dredge.

2) A 2"X2" screen at the end of the discharge pipe on the beach. The smallest screen sized opening will be attached to the end of the discharge pipe on the beach to capture tire pieces or debris that made it past the first screens. Debris collected inside the screen box will be collected and disposed of properly in an approved landfill or recycling center.

Contractor Observers will be stationed at the beachfill area and will discard all debris as described above. The USACE will also frequently inspect operations on the beach to monitor the quality of material being transported to the beach and take action as necessary to address any concerns with the quality of material being placed.

Regardless of the dredge plant used for the project, if the dredge encounters a pocket of material that contains tires/debris, the contractor will stop dredging in that area and move the dredge within the approved borrow area. Mechanical raking of the beachfill area during/after beachfill placement (i.e., Using a front-end loader, bobcat type, or similar mechanical equipment outfitted with a specialized bucket containing a rake and screen with screen opening size no larger than 2"X2") will be a contractual option that will be exercised if needed.

2.3 Alternative 3 – Emergency Repair Using the Masonboro Inlet Borrow Area

Alternative 3 would accomplish a one-time emergency repair to the Wrightsville Beach CSRM project by placing approximately 1,000,000 cubic yards (approximately 1,200,000 CY dredged) of beach quality sand on the beach using the historic

Masonboro Inlet borrow area, including a portion of Banks Channel (Figure 1). Although Masonboro Inlet, which is located within the Coastal Barrier Resources System Unit L09 (Figure 1), is no longer available to use as a borrow source, this alternative is carried forward in Section 3 for comparison purposes.

Located immediately southwest of the project site, Masonboro Inlet/Banks Channel receives and retains suitable sand via longshore current. As a result, Masonboro Inlet/Banks Channel has historically served as a reliable sand source for the authorized project. Due to depth restrictions for hopper dredges, it is likely a hydraulic cutterhead dredge would be used in the inlet, requiring the pipeline to cross the southern end of Wrightsville Beach. The repair (renourishment) from the inlet would take approximately 45 days and to the greatest extent practicable, would occur from November 16 to March 31, to avoid potential impacts to nesting sea turtles and the significant bird nesting site at the southern end of Wrightsville Beach. Pipeline placement would be coordinated with the appropriate resource agencies to minimize impacts to the nesting area at the southern end of Wrightsville Beach. The Masonboro Inlet/Banks Channel borrow area limits constitute a polygonal area of around 154 acres, which ranges in width from 600 feet to 1,600 feet with a total length of about 9,000 ft. (Figure 1). The Masonboro Inlet/Banks Channel borrow area depths range from -20 feet to -30 feet MLLW. Water depths and sediment volumes within the Masonboro Inlet/Banks Channel borrow area vary due to naturally-occurring sediment entrainment and deposition.

3 AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS

The focus of this chapter is to describe the affected environment and environmental consequences that may result by implementation of the three alternatives, listed below. Much of the project and its impacts have been evaluated in previous NEPA documents (Section 1.4), therefore only the changes in the refined borrow areas, the adoption of the updated National Marine Fisheries Service's 2020 SARBO and the new alternatives considered will be covered in this Section. Due to the variability of the dredging timeframes and repair durations, Table 2 below is provided for reference.

Alternative 1 (No Action) - No Emergency Repair

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area

Table 2. Dredging Timeframes and Estimated Repair Durations

	Proposed Action		**Alternative 3**	
Dredge Type	**Dredging Timeframe**	**Estimated Repair Duration**	**Dredging Timeframe**	**Estimated Repair Duration**
1 Hopper Dredge	December 1 - March 31	110 days	*N/A	N/A
2 Hopper Dredges	December 1 - March 31	55 days	N/A	N/A
Hydraulic Cutterhead	November 16 - April 30	50 days	November 16 - March 31	45 days

*Not Applicable

3.1 Geology and Sediments

Wrightsville Beach is a modern transgressive barrier island that lies along the southwestern side of Onslow Bay, between Cape Lookout and Cape Fear (NCGS, 1985). Sedimentary strata on the island consists of unlithified Quaternary surficial clastic sediments that unconformably overlie either Oligocene (Synder et al., 1991) or Eocene (Harris and Zullo, 1991) sandy, molluscan-mold and bryozoan-echinoid limestone. A compilation of data from aerial photographs, cores, and historical nautical charts show the entire island rests on inlet fill (Cleary and Pilkey,1996). Landward, the stratigraphy of the area consists of unconformity bound, off-lapping, Pliocene-Pleistocene, Eocene, and Cretaceous variably consolidated or lithified marine sediments that dip gently southeast toward the continental shelf. The distribution of sediments in Onslow Bay is controlled by underlying geology and the bio-erosion of this strata, which tends to produce a mobile, thin, patchy veneer which typically accumulates in shallow submerged basins (Riggs et al, 1996).

Typical USACE contract specifications for renourishment projects generally recognize suitable beach material as Poorly Graded Sand, or Poorly Graded Sand with Silt per the

Unified Soil Classification System, as long as the portion of material meets these criteria:

- **Less than 10 percent, by weight, material passes #200 sieve over weighted average.**
- **Less than 10 percent, by weight, material retained on the #4 sieve over weighted average.**
- **Material retained on the 3/4 inch sieve does not exceed, by percentage or size that found on the native beach.**
- **Contains no construction debris, toxic material, or other foreign matter.**
- **Contains no clasts or lithified rock.**

The USACE guideline for beach placement is no more than 10 percent of the material passing the # 200 sieve, i. e., dredged material must be ≥90 percent sand. All dredged material to be placed on Wrightsville Beach meets the USACE guidelines above. A full discussion of sediment and geology can be found in Appendix A, Geotechnical.

Alternative 1 (No Action) - No Emergency Repair
The No Action alternative would result in continued erosion of sand within the CSRM project area, shrinking the footprint of the barrier island and increasing risks of storm damage until funding becomes available to perform the next required renourishment.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
This alternative would result in the emergency repair permanently removing beach quality sediment from the offshore borrow area. The repair would remove approximately 1,200,000 CY (364 acres of previously undisturbed area) of beach quality sediment from the offshore borrow source, of which approximately 1,000,000 CY will be placed on the shore due to dredging losses during repair. The introduction of approximately 1,000,000 CY of sand into the Beach/Inlet system from an offshore borrow source may result in increased shoaling in Mason Inlet (north end of Wrightsville Beach) and Masonboro Inlet (south end of Wrightsville Beach) due to longshore drift, which will result in the need for more frequent dredging of the respective navigation channels.

As part of the borrow area use plan, the contractor will recover the maximum amount of beach quality sand within one portion of the borrow area using a two-foot buffer (i.e., leaving approximately two feet of sand on the bottom) before relocating to another area within the borrow area. Maximum recovery of material shall be determined by dredging equipment efficiencies, entrainment of unsuitable material, or the maximum dredging depth determined by the government, whichever depth is less.

Significant infilling of the offshore borrow areas as a result of longshore sediment transport processes would not be expected to occur. However, considering the shallow dredge volumes of material to be removed from the borrow areas, some infilling of sediments could still occur from other storm- and current-driven processes. Although, some infilling of the borrow areas is anticipated from sedimentation and side sloughing, as well as wind- and tidal-driven currents, the bathymetric feature of the post-dredging borrow area would be expected to persist.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
Beach quality sediment would be removed from the Masonboro Inlet Borrow Area, impacting approximately 154 acres within the previously disturbed borrow area. From 1981 to 2018, sand was dredged once every four years from Masonboro Inlet to renourish the Wrightsville Beach CSRM project. Removal of the repair material from Masonboro Inlet would constitute sand recycling from the Beach/Inlet system and would not increase shoaling in Mason or Masonboro Inlet. Significant infilling of the inlet borrow areas as a result of longshore sediment transport processes would be expected to occur. Use of an offshore borrow source instead of Masonboro Inlet would require separate maintenance dredging of the Masonboro Inlet navigation channel, thereby increasing costs to maintain inlet navigability as compared to the past, when large volumes of beach quality material were regularly removed from the inlet to renourish the CSRM project, satisfied both navigation and CSRM needs.

3.2 Water Resources

3.2.1 Hydrology

Tides in the project area are semidiurnal and the mean tidal range (difference between mean high water and mean low water) is approximately 3.99 feet. Wind can factor into the tide level, but it is not a major factor since this is an ocean facing beach.

3.2.2 Water Quality

All surface waters in North Carolina are assigned a primary classification by the North Carolina Division of Water Resources (15A NC Administrative Code 02B .0301 to .0317). Waters in the vicinity of the study area fall into two classifications. Waters of Masonboro Inlet and Banks Channel are classified as SC and High Quality Waters (HQW). SC waters are suitable for secondary recreation such as fishing, boating, and other activities involving minimal skin contact, aquatic life propagation and survival, and wildlife. HQW are waters which are rated excellent based on biological and physical/chemical characteristics through North Carolina Division of Water Resources (NCDWR) monitoring or special studies, primary nursery areas designated by the Marine Fisheries Commission, and other functional nursery areas designated by the Marine Fisheries Commission. Waters of the Atlantic Ocean are classified as SB and are tidal salt waters protected for all Class SC uses in addition to primary recreation. Primary recreational activities include swimming, skin diving, water skiing, and similar uses involving human body contact with water where such activities take place in an organized manner or on a frequent basis.

Inlets are highly dynamic and interact with ocean longshore currents, waves and tidal influences. Storms and maintenance dredging of the navigation channel all add to the levels of turbidity and suspended solids in the inlet.

The project area is in NCDWR White Oak River basin and U.S. Geologic Survey (USGS) Southwest Hydrologic Unit 03020302.

If a waterbody does not meet the state designated use standards, it is considered impaired and is placed on the 303(d) list. There are no designated 303(d) waters within the project area.

NCDWR Section 401 Water Quality Certification (WQC) under the Clean Water Act of 1977 (PL 95-217) are issued for projects that result in a regulated discharge of material. Pursuant to 33 C.F.R. § 335.7, and meeting the environmental standards established by the Clean Water Act Section 404(b)(1) evaluation process, a 404(b)(1) analysis is included as Appendix D and will be finalized prior to conclusion of the NEPA process.

During the emergency repair, beach placement would cover a total length of approximately 15,650 feet of beach. Progress along the beach would be expected to move at a relatively slow rate (i.e., 300 ft. per day). Sand dikes would be used during beach placement to reduce turbidity. Sand dikes are constructed with earth-moving equipment and run parallel with the existing beach. Typically, a sand dike is constructed from the existing beach sand and runs several hundred feet in front of the sand discharge location. The sand dike provides a space for the settling of the discharged slurry, so as much sand as possible is retained on the beach and water discharging into the ocean is less sediment-laden than it otherwise would be without the sand dike.

Dredging and placement of beach quality material increases the suspended sediments in the water column (total suspended solids) which can affect species or habitat by burying them as the sediment settles, or sediments can be harmful to fish gills. Hopper dredging also has the added impact of increased total suspended solids in the water column due to overflow. If the sediment in the water column is nutrient rich or contains oxygen depleting chemicals, it can deplete oxygen in the surrounding water, potentially leading to anoxic or hypoxic conditions that are harmful to species that are not air breathing like sea turtles and marine mammals. Suspended sediments also affect turbidity, an optical property of water (measured in nephelometric turbidity units, or NTUs) that affects light penetration into the water column. During dredging, turbidity increases outside the dredging area should be less than 25 NTUs to be considered insignificant. In the case of overflowing hopper dredges or scows to obtain economic loading, sediment that is ≥90% sand is not likely to produce significant turbidity or other water quality impacts (USACE, 1997). The material to be removed from the borrow areas will be comprised of ≥90% sand. Sandy material is heavier than fine silt or clay, so it falls out of suspension more quickly, resulting in less turbid waters. Based on past research, dredging and placing beach quality material have proven to have little to no effect on water quality since material will dissipate from the water column relatively rapidly.

USACE, Wilmington District, and the US Army Engineer Research and Development

Center (ERDC) conducted a study that monitored water quality levels during trailing-suction-hopper dredge operations at Beaufort Inlet, NC, during July 2020. Both ERDC and the NC Department of Environment and Natural Resources (NCDENR) conducted water quality sampling. The report concluded the dredging increased turbidity values by 2 NTUs up to 11 NTUs, but those peak values only lasted a few minutes and therefore were considered insignificant to water quality (Balazik, 2020a). Since sediments from the proposed borrow area will likely be coarser than Beaufort Inlet sediments, turbidity values are not expected to reach the same levels. More information regarding suspended sediments and turbidity may be found in the 404(b)(1) Analysis in Appendix D.

As water temperatures increase, dissolved oxygen (DO) levels in the water decrease due to biological and chemical oxygen demands. Dissolved oxygen data were also taken in conjunction with the turbidity data during the Beaufort Inlet study. Based on these data, the study showed that hopper dredging in this situation has no significant long-term impacts on dissolved oxygen (Balazik, 2020a). During January and July of 2020, the USACE and the ERDC conducted a study to get a better understanding of DO dynamics in close proximity of mechanical clamshell (MC) dredge operations in the Cape Fear River. DO never exceeded 4.8mg/L (75% saturation) around the dredge during the sampling operation. These data suggest chronic MC dredging in the lower Cape Fear River poses no to little risk of reducing DO and therefore not causing respiration problems for fauna of concern (Balazik, 2020b).

Both of the previous studies occurred in relatively confined waterbodies compared to the borrow sites offshore of Wrightsville Beach. Based on the grain sizes being dredged and the vast spatial scale of the borrow sites, which are located in the open ocean, it is highly unlikely dredging will have any effect on DO that would be deleterious to fauna or flora in the area (Balazik, Personal Communication, 2021).

Pursuant to Section 401 of the Clean Water Act of 1977 (P.L. 95- 217), as amended, a Water Quality Certification (WQC) is required for this proposed project. The Proposed Action is covered under the North Carolina Division of Water Resources December 1, 2017, Water Quality General Certification (WQC) No. 4153: General Certification for Emergency Dredging. All conditions of the water quality certification will be implemented in order to minimize adverse impacts to water quality.

Pursuant to Section 404 of the Clean Water Act, the impacts associated with the discharge of fill material into waters of the United States are discussed in the Section 404(b)(1) (P.L. 95-217) Guidelines Analysis in Appendix D. Discharges associated with dredging in the offshore borrow areas are considered incidental to the dredging operation, and therefore, are not being considered as being a discharge addressed under the *Section 404(b)(1) Guidelines Analysis*.

As discussed in detail below, water quality impacts for all alternatives considered would be expected to be short-term and minor. Living marine resources dependent on good water quality should not experience significant adverse effects from water quality changes.

Alternative 1 (No Action) - No Emergency Repair:
This alternative would have no effect on water quality.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas:
Dredging in the offshore borrow area would involve mechanical disturbance of the bottom substrate and subsequent redeposition of suspended sediment and turbidity generated during emergency repair dredging at both the draghead and water column. The beach quality material could be dredged by one hopper, which would be anticipated to take an estimated 110 days; if two hoppers are used, they would concurrently work an estimated 55 days (each). Factors that are known to influence sediment spread and turbidities are grain size, water currents and depths. During emergency repairs, there would be elevated levels of turbidity and suspended solids in the borrow area and the immediate area of sand deposition when compared to the existing non-storm conditions of the surf zone. Past projects indicate that the extent of the hopper dredging sediment plume is generally limited to between 1,640 – 4,000 feet from the dredge and that elevated turbidity levels are generally short-lived, on the order of an hour or less (NASA, 2013). Significant increases in turbidity are not expected to occur outside the immediate dredging and beach repair area (turbidity increases of 25 nephelometric turbidity units [NTUs]) or less are not considered significant). Turbid waters (increased turbidity relative to background levels but not necessarily above 25 NTUs) would stay close to shore and be transported with waves either up-drift or down-drift depending on wind conditions. Because of the low percentage of silt and clay in the borrow areas (≤ 10 percent), turbidity impacts would not be expected to be greater than the natural increase in turbidity and suspended material that occurs during storm events. Any increases in turbidity in the borrow area and water column during emergency repairs would be expected to be temporary and limited to the area surrounding the dredging. Turbidity levels would be expected to return to background levels in the borrow area, water column and surf zone when dredging ends.

As stated in the Geotechnical Appendix (Appendix A), offshore borrow area C has a bathymetric depth range from -46 ft. to -54 ft with the average usable sand thickness of 5.6 ft. Offshore borrow area D has a bathymetric depth range from -47 ft. to -58 ft. with an average usable sand thickness of 7.0 ft. Hopper dredges are mobile and are most productive dredging smaller depths of cut of approximately 3 ft. over larger areas rather than dredging to larger depths of cut over smaller areas, as is the case with hydraulic cutterhead dredges. As part of the borrow area use plan, the contractor will recover the maximum amount of beach nourishment material within one portion of a borrow area using a two-foot buffer (i.e., leaving approximately 2 feet of sand on the bottom) before relocating to another portion of the same borrow area or to a separate borrow area. Maximum recovery of material shall be determined by dredging equipment efficiencies, entrainment of unsuitable nourishment material, or the maximum dredging depth determined by the government. Overall, the post-dredging borrow area depressions would not be significant and will avoid creating deep depressions or pits, which could result in low dissolved oxygen (DO). According to the existing pre-dredge depths and the anticipated average depths of material removed, post-project borrow area depressions would likely not exceed 10 feet below the pre-dredged depths.

Table 3. Presence of Important Fisheries Species (Eggs, Larvae and Early Juveniles) from April - November

	April	***May***	***June***	***July***	***August***	***September***	***October***	***November***
River	Atlantic Sturgeon, American Shad, River Herring	Atlantic sturgeon, American Shad, River Herring	Atlantic sturgeon, American Shad, River Herring	River Herring	Atlantic sturgeon, River Herring	Atlantic sturgeon	Atlantic sturgeon	Atlantic sturgeon
Inlet	White Shrimp, Blue Crab, Gag Grouper, Summer Flounder	White Shrimp, Pink Shrimp, Blue Crab	White Shrimp, Pink Shrimp, Blue Crab	Pink Shrimp, Blue Crab	Blue Crab	Blue Crab	Blue Crab	Southern Flounder
Estuary	White Shrimp	White Shrimp, Gag Grouper	White Shrimp, Gag Grouper	White Shrimp	Red Drum	Red Drum	Red Drum	N/A
Ocean	Pink Shrimp, Blue Crab, Gag Grouper, Summer Flounder	Pink Shrimp, Blue Crab, Gag Grouper	Pink Shrimp, Blue Crab	Pink Shrimp, Blue Crab	Blue Crab	Blue Crab	Brown Shrimp, Summer Flounder	Brown Shrimp, Summer & Southern Flounder
Total	**8 species**	**8 species**	**7 species**	**4 species**	**4 species**	**3 species**	**5 species**	**4 species**

Turbidity levels would be expected to return to background levels in the benthic zone and water column when dredging and placement ends. Overall water quality impacts of this alternative would be expected to be short-term and minor. Living marine resources dependent on good water quality should not experience significant adverse effects from water quality changes.

Indirect effects of using the offshore borrow areas, which would introduce about 1,000,000 cubic yards of sand to the beach/inlet system may result in increased shoaling in both Masonboro Inlet and Mason Inlet (north end of Wrightsville Beach). This may result in more dredging of the federally-maintained Masonboro Inlet to ensure safe navigation, thereby increasing the amount of dredging required as compared to the past use of Masonboro Inlet as borrow source, which satisfied both navigation and CSRM needs. This may result in an increase in the number of dredging events in the vicinity of

Wrightsville Beach, directly increasing temporary impacts on water quality in both the inlet and offshore. Overflow impacts from hopper dredging are expected to be insignificant.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area:
Impacts of this alternative would be similar to the proposed action; however, the indirect impacts of introducing approximately 1,000,000 cubic yards of sand to the beach/inlet system would not occur. Dredging in the Masonboro Inlet borrow area would involve mechanical disturbance of the bottom substrate and subsequent redeposition of suspended sediment and turbidity generated during the estimated 45 days of dredging in the inlet, as compared to 110 days of dredging (or two hoppers working concurrently for an estimated 55 days each) in the offshore borrow areas (proposed action). Water quality impacts would be slightly less than the impacts of the proposed action due to the decreased duration of the dredging. Additionally, there would be no overflow impacts to the water column from to the use of a cutter dredge as opposed to a hopper dredge. Overall water quality impacts of this alternative would be expected to be short-term and minor. Living marine resources dependent on good water quality should not experience significant adverse effects from water quality changes.

3.3 Wetlands and Floodplains

3.3.1 Wetlands

Executive Order 11990 directs all Federal agencies to issue or amend existing procedures to ensure consideration of wetlands protection in decision making and to ensure the evaluation of the potential effects of any new construction proposed in a wetland.

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions (33 C.F.R. § 328.3). Wetlands possess three essential characteristics: hydrophytic vegetation, hydric soils, and wetland hydrology.

Although abundant salt marsh and tidal creek wetlands are in the area, no wetlands are found along the ocean shoreline of the CSRM project area. Along the Wrightsville Beach shoreline and within offshore borrow sources, there are no Section 404 jurisdictional wetlands that would be impacted by the proposed project. This project is in full compliance with EO 11990.

3.3.2 Floodplains

The 100-year flood plain is established by the Federal Emergency Management Agency (FEMA) and is identified on Federal Insurance Rate Maps. Base flood elevations for flood zones and velocity zones are also identified by FEMA, as are designated floodways. All portions of the project area are within the 100-year floodplain.

Executive Order 11988 requires Federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, "[e]ach agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities…"

The floodplain in the study area is being adversely affected by erosion and the continued deterioration of the beach and dune complex. Those effects would become more pronounced as the beach continues to erode and future storms encroach on the area. Any placement of material on the beach would occur within the 100-year floodplain and would therefore constitute an alteration of the floodplain, displacing the floodplain seaward. Placement of dredged material on Wrightsville Beach cannot be accomplished outside the floodplain.

Alternative 1 (No Action) - No Emergency Repair:
The No Action alternative will result in no changes to wetlands or hydrology, but the continued erosion would cause permanent loss of land area in the floodplain along the Wrightsville Beach oceanfront.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas:
The proposed action will result in insignificant changes throughout the project area and therefore will not alter existing hydrology in the floodplain. The eight steps discussed in E.O. 11988 are addressed as follows:

1. Floodplain and/or wetland determination. The project is within the 100-year floodplain. The proposed action will not adversely impact any floodplains or wetlands, upstream, within, or downstream of the project.

2. Public notification. Public involvement began with scoping and will continue throughout the NEPA process. This report will be provided to the public for comment. All comments received will be considered during development of the final EA.

3. Identify and evaluate practicable alternatives to locating in the base floodplain. The EA discusses all practicable alternatives and since the project involves beach repair, there is no alternative outside the Floodplain.

4. Identify the impacts of the Proposed Action. Impacts of the Proposed Action are fully discussed in the EA and are compared in an impact analysis (Table 12).

5. Evaluate measures to reduce potential adverse impacts of the proposed action. The description of the proposed action addresses measures to reduce some adverse impacts. Section 3 of this EA contains a thorough analysis of all positive and negative impacts and presents them in an Impact Analysis table (Table 12). Measures to minimize impacts to endangered species under the purview of the USFWS are also addressed in detail in Appendix E.

6. Re-evaluate the alternatives. All alternatives were thoroughly evaluated during the USACE planning process, and are presented in this EA.

7. Make the final determination and present the decision. The final determination and presentation of the proposed action will be included in the final EA.

8. Implement the action. Implementation of the proposed action will result in no significant impacts to floodplains or wetlands. The existing hydrology of the floodplain will not be changed. The proposed action complies with Executive Order 11988.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area:
Relative to wetlands and floodplains, impacts of Alternative 3 would be the same as the proposed action.

3.4 Marine Environment

The marine environment section encompasses surf zone and nearshore ocean fishes, nekton, larval entrainment, benthic resources and essential fish habitat. Dredging and placement of material are expected to result in minor and short-term turbidity increases and entrainment.

3.4.1 Surf Zone and Nearshore Ocean Fishes

The Southeast Area Monitoring and Assessment Program-South Atlantic (SEAMAP-SA) has conducted annual nearshore (depths 15-60 feet) trawl surveys for demersal fishes in Onslow Bay since 1986. Catches have been consistently dominated by sciaenid fish that utilize estuaries during part of their life cycle. Overall patterns of demersal fish abundance are strongly influenced by the high abundance of spot and Atlantic croaker. These two species have been consistently dominant, accounting for more than 36% of the total catch between 1990 and 1999. Other abundant demersal fishes in this region include the Atlantic bumper (*Chloroscombrus chrysurus*), scup, pinfish, star drum (*Stellifer lanceolatus*), banded drum (*Larimus fasciatus*), gray trout (*Cynoscion regalis*), silver seatrout (*C. nothus*), southern kingfish, and inshore lizardfish.

Peterson and Wells (2000) documented seasonal variations (November, February, and May) in demersal fish communities at inshore (approximately one mile) and offshore (approximately five miles) soft bottom sites off the southern NC coast. In November, catches at the offshore sites were dominated by spot (>50% of total catch), pinfish, pigfish, and croaker; while the inshore sites were dominated by croaker, silver perch (*Bidyanus bidyanus*), Atlantic silversides, pinfish, and striped mullet (*Mugil cephalus*). In February, total catches at the offshore and inshore sites were reduced by 96% and 59%, respectively. Pinfish, Atlantic menhaden, and silversides collectively accounted for 96.4% of the total combined inshore/offshore catch in February. The combined inshore/offshore totals for spot and croaker were reduced by 98.9% and 99.8%, respectively, and catches of all other taxa decreased sharply, with the exception of silversides and pinfish at the inshore sites. During the May sampling period, large numbers of Atlantic silversides and Atlantic threadfin herring (*Opisthonema oglinum*) increased the total inshore catch. Peterson and Wells (2000) also analyzed the stomach contents of demersal fishes that were caught during the November sampling period and found that croakers and pinfish were primarily consuming polychaete worms, bivalves, grass shrimp, and pinnotherid crabs. Silver perch, pigfish, and spot consumed polychaetes, grass shrimp, and other small bottom-dwelling crustaceans. Gray trout consumed grass shrimp, penaeid shrimp, and portunid crabs; whereas kingfishes primarily consumed pinnotherid crabs, portunid crabs, and large polychaete worms.

Waters within nearshore areas are more dynamic and susceptible to higher turbidity, especially during storms. Species that depend on these areas are commonly more tolerant of elevated turbidity levels. Any fine-grained material can remain in suspension during hopper dredging and overflow, potentially clogging gills of fish present within the water column. The material to be removed from the borrow areas will be comprised of ≥90% sand and is expected to contain very little fines. Depending on sea conditions, turbidity can be detected as far as two miles, possibly due to the elevated concentration of low-density organic matter from fragmented benthos discharged during sorting (Newell et al. 2003).

The primary organisms subject to entrainment are bottom-oriented fishes and shellfishes (flounder, crabs, skates and stingrays). Organisms resting, feeding, or inhabiting the bottom would be closer to the suction field of the draghead and, therefore, at higher risk. Both demersal and pelagic fish eggs and larvae are susceptible to entrainment, as well as other slow-moving organisms found in nearshore habitats. However, a dredge operating in an open ocean environment would pump a very small amount of water in proportion to the surrounding water volume.

Table 4. Summary of the Most Sensitive Life Stages (Eggs, Larvae and Early Juveniles) for Each of the Fisheries Species in the Ocean Throughout the Year. (Green boxes represent abundant eggs and/or larvae present)

Fishery Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Brown Shrimp	■									■	■	■
Pink Shrimp				■	■	■	■					
Blue Crab				■	■	■	■	■	■			
Gag Grouper			■	■	■							
Summer Flounder	■	■	■	■						■	■	■
Southern Flounder	■	■									■	■

Alternative 1 (No Action) - No Emergency Repair:
This alternative would have no effect on surf zone or nearshore ocean fishes.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas:
Potential impacts to fisheries in the surf zone and nearshore areas would be predominantly due to entrainment and turbidity during the removal of beach quality sediment (approximately 110 days of dredging) (or two hoppers working concurrently for an estimated 55 days each); however, impacts are expected to be insignificant. A very small percentage of demersal and pelagic fishes are subject to entrainment, so dredging is not expected to significantly affect the local or regional populations. Fish may be captured if relocation trawling is implemented, but the amount is expected to be

minor. Additionally, there would be dredging impacts to the Masonboro Inlet area due to maintenance of the navigation channel. Overall, these impacts would not be significant when considering the vastness of habitat in the ocean as compared to the footprint of the identified borrow sites, the areas disturbed by placement and the temporary nature of the disturbance.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area:
The approximate 45 days of dredging in Masonboro Inlet borrow area would result in increased turbidity during that time. However, the opportunistic behavior of the organisms within the dynamic inlet area would enable them to adapt to short-term disturbances. The main difference between Alternative 3 and Alternative 2 is that use of the inlet borrow source would result in a shorter construction timeframe, resulting in a shorter duration of increased turbidity. Also, this alternative would remove the need to conduct navigational dredging in Masonboro Inlet. Due to the use of a hydraulic cutterhead dredge, no relocation trawling impacts are anticipated. Because of the adaptive ability of organisms in the area and the avoidance of peak recruitment and abundance time frames with a November 16 to March 31 renourishment timeframe, such effects would be expected to be temporary and minor.

3.4.2 Nekton

Oceanic nekton are active swimmers, not at the mercy of the currents, and are distributed in the relatively shallow oceanic zone. They are composed of three phyla-chordates, mollusks, and arthropods, with chordates (i.e., fish species) forming the largest portion. Any entrainment of adult fish, and other motile animals in the vicinity of the borrow areas during dredging would be expected to be minor because of their ability to actively avoid the disturbed areas. Fish species are expected to leave the area temporarily during the dredging operations and return when dredging ceases (Pullen and Naqvi, 1983). Larvae and early juvenile stages of many species pose a greater concern than adults because their powers of mobility are either absent or poorly developed, leaving them subject to transport by tides and currents. That physical limitation makes them potentially more susceptible to entrainment by an operating hydraulic dredge. Benthic-oriented organisms close to the dredge draghead could be captured by the effects of its suction field and entrained in the flow of dredged sediment and water. As a worst-case, it could be assumed that entrained animals experience 100 percent mortality, although some small number might survive. Susceptibility to this effect depends on avoidance reactions of the organism, the efficiency of its swimming ability, its proximity to the draghead, the pumping rate of the dredge, and possibly other factors.

The biological effect of hydraulic entrainment has been a subject of numerous studies conducted nationwide to assess its effect on early life stages of marine resources, including larval oysters, post-larval brown shrimp (Van Dolah et al., 1992), striped bass eggs and larvae (Burton, 1993), juvenile salmonid fishes, and Dungeness crab. The studies indicate that the primary organisms subject to entrainment by hydraulic dredges are bottom-oriented fishes and shellfishes. The significance of entrainment effects depends on the species present; the number of organisms entrained; the relationship of the number entrained to local, regional, and total population numbers; and the natural mortality rate for the various life stages of a species. Assessing the significance of entrainment is difficult, but most studies indicate that the significance of impact is low.

Alternative 1 (No Action) - No Emergency Repair:
This alternative would have no effect on nekton.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas:
Entrainment of adult fish, and other motile animals in the vicinity of the borrow areas during dredging would be expected to be minor because of their ability to actively avoid the disturbed areas. Fish species are expected to leave the area temporarily during the dredging operations and return when dredging ceases, therefore work would not result in any significant impacts to nekton.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area:
Impacts of Alternative 3 would be similar to the proposed action. Due to nekton's ability to avoid the disturbed areas, entrainment impacts are expected to be minor.

3.4.3 Larval Entrainment

Masonboro Inlet, which is about 2.5 miles northwest of Borrow Area C, is an important passageway for the larvae of many species of commercially or ecologically important fish. Spawning grounds for many marine fishes are believed to occur on the continental shelf with immigration to estuaries during the juvenile stage. The shelter provided by the marsh and creek systems in the sound serves as nursery habitat where young fish undergo rapid growth before returning to the offshore environment. Those free-floating planktonic larvae lack efficient swimming abilities and are, therefore, susceptible to entrainment by an operating hydraulic or hopper dredge as they immigrate from offshore to inshore waters.

Alternative 1 (No Action) - No Emergency Repair:
This alternative would have no effect on larval entrainment.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas:
Under the worst-case scenario with the highest concentrations of larvae possible based on spatial and temporal distribution patterns, the maximum percentage entrained barely exceeds 0.1 percent per day. Although any larvae entrained (calculations indicate 914 to 1.8 million depending on the initial concentration in the tidal prism) would likely be killed, the effect at the population level would be expected to be insignificant. On the basis of those calculations indicating an *insignificant* larval entrainment impact, at the population level, from hydraulic dredging activities within a representative high concentration *inlet bottleneck* as documented in the study at Beaufort Inlet, North Carolina, the risk of larval entrainment from dredging activities in the offshore borrow areas would likely be slightly less than Alternative 3 and would not be expected to adversely affect marine fish larvae. Accounting for the additional impacts that would

occur from resultant need of navigational dredging overall impacts would not be significant.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area: Impacts of Alternative 3 would be similar to the proposed action with the potential for slightly increased impacts since inlets are important passageways for larvae, as compared to the open ocean. Overall, this alternative will have no significant effects on larval entrainment.

3.4.4 Benthic Resources

Aquatic organisms that live in close association with the bottom, or substrate, of a body of water, are collectively called the benthos. Benthic communities provide a link between planktonic and benthic production and commercially important fish species (Posey, 1991). The primary organisms subject to entrainment by hopper dredges are bottom-oriented fishes and shellfishes (flounder, crabs, skates and stingrays). Organisms resting, feeding, or inhabiting the channel bottom would be closer to the suction field of the draghead and, therefore, at higher risk.

Benthic communities of the project area exhibit a wide range of organism composition and density, and community structure may vary considerably depending on substrate type, salinity regime, proximity to structural habitat, and the like. Benthic substrate type and structural habitat within the project area range between fine- to coarse-grained sand and shell hash. Specifically, the nearshore soft bottom environment just offshore of the beach face consists of transitioning regions of shell hash and sand.

The footprint of the emergency repair at Wrightsville Beach would encompass a total of about 77 acres along the shoreline (15,560 linear feet). The beach community is comprised of a dry berm zone located beyond the high tide line, an intertidal zone that is alternately covered and exposed by tidal action, and a subtidal zone that occurs below the low tide line and extends seaward, merging with the ocean surf. In general, beaches are gently sloping communities that serve as transitional areas between open water and upland terrestrial communities. These communities experience almost continuous changes as they are exposed to erosion and deposition by winds, waves and currents. Sediments are unstable and vegetation is absent. Wave action, longshore currents, shifting sands, tidal rise and fall, heavy predation, and extreme temperature and salinity fluctuations combine to create a rigorous environment for macroinvertebrates.

During the emergency repair, beach placement would cover approximately 1,000 feet of the beach at any one time of the 15,650 foot-long project. Progress along the beach for the repair would be expected to move at a relatively slow rate (i.e., 300 ft. per day). Such a rate of progress is slow enough that surf-feeding fishes and shorebirds can move to other areas that are not affected by the repair operation. As the sand placement operation passes by a section of beach, that area is soon available for recolonization by invertebrates.

Offshore sand bottom communities along the North Carolina coast are relatively diverse habitats containing over 100 polychaete taxa. Tube dwellers and permanent burrow dwellers are important benthic prey for fish and epibenthic invertebrates. These species are also most susceptible to sediment deposition, turbidity, erosion, or changes in sediment structure associated with sand mining activities, compared to other more mobile polychaetes. Because periodic storms can affect benthic communities along the Atlantic coast to a depth of about 115 feet (35 meters), the soft bottom community tends to be dominated by opportunistic taxa that are adapted to recover relatively quickly from disturbance. Many faunal species documented on the ebb tide delta are important food sources for demersal predatory fishes and mobile crustaceans, including spot, croaker, weakfish, red drum, and penaeid shrimp. These fish species congregate in and around inlets during various times of the year, presumably to enhance successful prey acquisition and reproduction (Deaton et al. 2010).

Alternative 1 (No Action) - No Emergency Repair:
This alternative would have no effect on benthic resources.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas:
Beach placement would cover a maximum of 77 acres on Wrightsville Beach, resulting in negative effects on intertidal macrofauna through direct burial or increased turbidity in the surf zone; such effects would be expected to be localized, short-term, and reversible. As soon as beach sections are completed benthic recovery will begin and therefore the entire 77 acres will not be buried all at once. Any reduction in the numbers or biomass (or both) of intertidal macrofauna present immediately after beach placement may have localized limiting effects on surf-feeding fishes and shorebirds because of a reduced food supply. In such instances, those animals may be temporarily displaced to other locations, but would be expected to return within 1–2 years following placement.

Impacts on the sea floor from dredging will result in the removal of upper layers of substrate, resulting in approximately 364 acres of new benthic impacts. One hundred percent (100%) mortality of benthos existing within the dredging and placement footprint can be assumed, and this reduction of food availability for bottom feeding fish and invertebrates can impact fish productivity. Pumpout locations and the associated pipeline route to the beach will also cause temporary impacts to benthic resources by covering the affected area during repair. As part of the borrow area use plan, the contractor will recover the maximum amount of beach nourishment material within one portion of a borrow area using a two-foot buffer (i.e., leaving approximately two feet of sand on the bottom) before relocating to another area within the offshore borrow areas identified for the emergency repair. Maximum recovery of material shall be determined by dredging equipment efficiencies, entrainment of unsuitable nourishment material, or the maximum dredging depth determined by the government. Since dredging will deplete the sand within the work area before moving to the next area, removal of benthos and benthic habitat by dredging activities represents a one-time temporary resource loss since the borrow areas will become recolonized by benthic organisms within a matter of months. Additional dredging, and associated impacts, to account for the subsequent need for navigation dredging would be expected in Masonboro Inlet.

Significant infilling of the offshore borrow areas as a result of longshore sediment transport processes would not be expected to occur. However, considering the shallow dredge volumes of material to be removed from the borrow areas, some infilling of sediments could still occur from other storm- and current-driven processes. Although, some infilling of the borrow areas is anticipated from sedimentation and side sloughing, as well as wind- and tidal-driven currents, the bathymetric feature of the post-dredging borrow area would be expected to persist. Dredged areas would be expected to fully recover within 1–2 years. Therefore, dredging will result in minor impacts to benthic invertebrates, but would not result in any significant impacts to benthos. The ecological significance of temporary benthic losses is considered minor since the affected area is very small relative to the amount of benthic habitat present on the ocean bottom.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area:
Impacts of this alternative would be similar to the proposed action; however, 154 acres of impacts to previously disturbed benthos would occur as compared to 364 acres of new benthic impacts that would result from the proposed action. Also, no impacts will occur due to pumpout locations or the associated pipeline route to the beach.

3.5 Essential Fish habitat (EFH) and Habitat Areas of Particular Concern (HAPC)

Provisions of the Magnuson–Stevens Fishery Conservation and Management Act (MSFCMA) (16 USC 1801) require that Essential Fish Habitat (EFH) areas be identified for each species managed under a fishery management plan, and that all Federal agencies consult with the NMFS on all Federal actions that may adversely affect EFH. The USACE is the lead federal agency and BOEM serves as a cooperating agency for consultation requirements related to MSFCMA. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." The EFH assessment was prepared pursuant to Section 305(b)(2) of the MSFCMA and includes the following required parts: 1) identification of species of concern; 2) a description of the proposed action; 3) an analysis of the effects of the proposed action; 4) proposed mitigation; and 5) the Federal agency's views regarding the effects of the proposed action. The purpose of this EFH consultation process is to address specific federal actions that may adversely affect EFH, but do not have the potential to cause substantial adverse impact. Overall, water quality impacts of the proposed action would be expected to be short-term and minor and would result in no significant effects to EFH.

Certain forage species may be important indicators for the presence of EFH species; however, these forage species may not be listed as EFH. For further information on forage species for EFH, see Duval et al. 2016, Okey et al. 2014., CSA International, Inc. et al. 2009, Houde et al. 2014, and Ward Slacum et al. 2011., and South Atlantic Fishery Management Council 2018.

Habitat Areas of Potential Concern (HAPC) are subsets of EFH that have been identified for special consideration during planning due to the rarity of the environment, stressors from development, importance to federally managed species, or vulnerability to anthropogenic degradation (NOAA 2018). HAPCs that overlap the proposed area are listed in Table 5 have been considered within this assessment.

Table 5 shows the categories of EFH and Habitat Areas of Particular Concern (HAPC) for managed species that were identified in the Fishery Management Plan Amendments affecting the South Atlantic area. Table 6 lists the federally managed fish species of North Carolina for which Fishery Management Plans have been developed by the South Atlantic Fishery Management Council (SAFMC), Mid-Atlantic Fishery Management Council (MAFMC), and NMFS.

Table 5. Categories of Essential Fish Habitat and Habitat Areas of Particular Concern

ESSENTIAL FISH HABITAT	GEOGRAPHICALLY DEFINED HABITAT AREAS OF PARTICULAR CONCERN
Estuarine Areas	**Area - Wide**
Estuarine Emergent Wetlands	Council-designated Artificial Reef Special Management Zones
Estuarine Scrub	Hermatypic (reef-forming) Coral Habitat & Reefs
Submerged Aquatic Vegetation (SAV)	Hard Bottoms
Oyster Reefs & Shell Banks Intertidal Flats	Hoyt Hills
Palustrine Emergent & Forested Wetlands	Sargassum Habitat
Aquatic Beds	State-designated Areas of Importance of Managed Species
Estuarine Water Column Seagrass	Submerged Aquatic Vegetation
Creeks	
Mud Bottom	**North Carolina**
	Big Rock
Marine Areas	Bogue Sound
Live / Hard Bottoms	Pamlico Sound at Hatteras / Ocracoke Islands
Coral & Coral Reefs	Capes Fear, Lookout, & Hatteras (sandy shoals)
Artificial / Manmade Reefs	New River
Sargassum	The Ten Fathom Ledge
Water Column	The Point

Table 6. Essential Fish Habitat Species for Coastal NC (1 of 3)

E-EGGS L-LARVAL J-JUVENILE A-ADULT N/A-NOT FOUND	Mason Inlet	Banks Channel	Masonboro Inlet	Atlantic Ocean South of Cape Hatteras
COASTAL DEMERSALS				
Red Drum	E L J A	E L J A	E L J A	J A
Bluefish	J A	J A	J A	E L J A
Summer Flounder	L J A	L J A	L J A	E L J A
INVERTEBRATES				
Brown Shrimp	E L J A	L J A	E L J A	E L J A
Pink Shrimp	E L J A	L J A	E L J A	E L J A
White Shrimp	E L J A	L J A	E L J A	E L J A
Calico Shrimp	N/A	N/A	N/A	E L J A
COASTAL PELAGICS				
Dolphinfish	J A	N/A	J A	E L J A
Cobia	L J A	J A	L J A	E L J A
King Mackerel	J A	J A	J A	E L J A
Spanish Mackerel	L J A	L J A	L J A	E L J A
HIGHLY MIGRATORY				
Bigeye Tuna	N/A	N/A	N/A	E L J A
Bluefin Tuna	N/A	N/A	N/A	J A
Skip Jack Tuna	N/A	N/A	N/A	J A
Yellowfin Tuna	N/A	N/A	N/A	E L J A
Swordfish	N/A	N/A	N/A	E L J A
Blue Marlin	N/A	N/A	N/A	E L J A
White Marlin	N/A	N/A	N/A	E L J A
Sailfish	N/A	N/A	N/A	E L J A
Little Tunny	N/A	N/A	N/A	E L J A
SHARKS				
Spiny Dogfish	J A	N/A	J A	J A
Smooth Dogfish	J A	J	J A	J A
Small Coastal Sharks	J A	J A	J A	J A
Large Coastal Sharks	J A	N/A	J A	J A
Pelagic Sharks	N/A	N/A	N/A	J A
Prohibited/Research Sharks	J A	N/A	J A	J A

Table 6. Essential Fish Habitat Species for Coastal NC (2 of 3)

E-EGGS L-LARVAL J-JUVENILE A-ADULT N/A-NOT FOUND	Mason Inlet	Banks Channel	Masonboro Inlet	Atlantic Ocean South of Cape Hatteras
SNAPPER/GROUPER				
Black Sea Bass	L J A	L J A	L J A	E L J A
Bank Sea Bass	N/A	N/A	N/A	E L J A
Rock Sea Bass	J	J	J	E L J A
Gag	J A	J	J A	E L J A
Graysby	N/A	N/A	N/A	E L J A
Speckled Hind	N/A	N/A	N/A	E L J A
Yellowedge Grouper	N/A	N/A	N/A	E L J A
Coney	N/A	N/A	N/A	E L J A
Red Hind	N/A	N/A	N/A	E L J A
Goliath Grouper	N/A	N/A	N/A	E L J A
Red Grouper	N/A	N/A	N/A	E L J A
Misty Grouper	N/A	N/A	N/A	E L J A
Warsaw Grouper	N/A	N/A	N/A	E L J A
Snowy Grouper	N/A	N/A	N/A	E L J A
Yellowmouth Grouper	N/A	N/A	N/A	E L J A
Black Grouper	J	J	J	E L J A
Scamp	N/A	N/A	N/A	E L J A
Blackfin Snapper	N/A	N/A	N/A	E L J A
Red Snapper	N/A	N/A	N/A	E L J A
Cubera Snapper	N/A	N/A	N/A	E L J A
Lane Snapper	N/A	N/A	N/A	E L J A
Silk Snapper	N/A	N/A	N/A	E L J A
Vermillion Snapper	N/A	N/A	N/A	E L J A
Mutton Snapper	N/A	N/A	N/A	E L J A
Gray Snapper	J	J	J	E L J A
Gray Triggerfish	N/A	N/A	N/A	E L J A
Yellow Jack	J	J	J	E L J A
Blue Runner	J	J	J	E L J A
Crevalle Jack	J	J	J	E L J A
Bar Jack	J	J	J	E L J A
Greater Amberjack	N/A	N/A	N/A	E L J A
Almaco Jack	N/A	N/A	N/A	E L J A
Banded Rudderfish	N/A	N/A	N/A	E L J A
Atlantic Spadefish	N/A	N/A	N/A	E L J A
White Grunt	N/A	N/A	N/A	E L J A

Table 6. Essential Fish Habitat Species for Coastal NC (3 of 3)

E-EGGS L-LARVAL J-JUVENILE A-ADULT N/A-NOT FOUND	Mason Inlet	Banks Channel	Masonboro Inlet	Atlantic Ocean South of Cape Hatteras
SNAPPER/GROUPER (continued)				
Tomtate	N/A	N/A	N/A	E L J A
Hogfish	N/A	N/A	N/A	E L J A
Puddingwife	N/A	N/A	N/A	E L J A
Sheepshead	J A	J A	J A	E L J A
Red Porgy	N/A	N/A	N/A	E L J A
Longspine Porgy	N/A	N/A	N/A	E L J A
Sculp	N/A	N/A	N/A	E L J A
Blueline Tilefish	N/A	N/A	N/A	E L J A
Sand Tilefish	N/A	N/A	N/A	E L J A
SMALL COASTAL SHARKS	LARGE COASTAL SHARKS	PELAGIC SHARKS	PROHIBITED SHARKS	
Atlantic Sharpnose Shark	Silky Shark	Shortfin Mako	Sand Tiger	Reef Shark
Finetooth Shark	Tiger Shark	Porbeagle	Bigeye Sand Tiger	Narrowtooth Shark
Blacknose Shark	Blacktip Shark	Thresher Shark	Whale Shark	Smalltail Shark
	Spinner Shark	Ocean Whitetip Shark	Basking Shark	Atlantic Angel Shark
RESEARCH SHARKS	Bull Shark	Blue Shark	White Shark	Longfin Mako
Sandbar Shark	Lemon Shark		Dusky Shark	Bigeye Thresher
	Nurse Shark		Bignose Shark	Sharpnose Sevengill Shark
	Scalloped Hammerhead		Galapagos Shark	Bluntnose Sixgill Shark
	Great Hammerhead		Night Shark	Bigeye Sixgill Shark
	Smooth Hammerhead			

Some species are lumped into groups for EFH purposes and therefore will have identical EFH descriptions. Those species that have an affinity for sand/sediment resources, overlap depth, temporal, and temperature ranges in the project area, and have demersal habits, indicating potential use of the proposed borrow areas include the gag grouper, summer flounder and the scalloped hammerhead shark. These three species will be evaluated and used as a broad assessment of impacts to EFH species with higher potential for impacts.

Gag Grouper

The Gag is a large (up to 47.2 in total length), (85.9 lbs max weight) epinepheline serranid economically important in recreational and commercial fisheries in the Carolinas. Gag have an estuarine dependent life cycle and are one of the most abundant Groupers in the southeast, ranging from Massachusetts into the Gulf of Mexico.

Gag spawn during late winter to early spring (January to May), peaking in March and April in the Carolinas. Gag larvae develop for approximately 43 days, after which they recruit to estuaries during flood tides. Early juveniles ingress into South Carolina estuaries from April through June, peaking in April and early. The earliest collections of young juveniles in North Carolina were in May and June. Additionally, larval and early juvenile Gag abundance was reported highest from June through September sampling period in North Carolina estuarine waters, with highest from late April to mid-May with peak ingress around new moons. Juvenile Gag were caught from June through September sampling period in North Carolina estuarine waters, with highest catch per unit effort from July through August.

Larval and juvenile transport from offshore spawning locations, away from adult populations to estuarine nursery areas is a critical component of Gag life history. The interactions between spawning locations, physical processes, salinity, temperature, chemical cues, and habitat preferences are critical in determining larval settlement in estuaries (Peterson and Wells, 2000). Both natural and maintained inlets in North Carolina and South Carolina are important habitat related to the migration dynamics of Gag and other estuarine dependent species of snapper and grouper. Juvenile Gag live in estuarine waters during their first summer, typically residing in habitats high in salinity with natural and artificial structure. Juveniles prefer oyster reefs and shell rubble, seagrass beds, dredged canals, pilings, rock jetties, and artificial reefs. In North Carolina, Gag have been observed to move from seagrass beds to these complex substrates within estuaries between late June and July. Massive emigration from estuaries to nearshore ocean hard bottom habitats occurs in the fall (October) with the concurrent drop in water temperature. Adult Gag can be found at depths of 15 to 107 m (49 to 351 ft) along the continental shelf once they leave the estuaries. In offshore waters, Gag occupy natural and artificial reefs, including wrecks, hard bottom, shelf-edge scarps, ledges, sponge/coral habitats, and various other habitats providing vertical relief from the bottom.

Summer Flounder

Summer Flounder (*Paralichthys dentatus*) are found in inshore and offshore waters ranging from Nova Scotia, Canada to the east coast of Florida. In the United States, Summer Flounder are most abundant along the continental shelf and adjoining estuaries from Cape Cod, Massachusetts to Cape Fear, North Carolina. Juveniles and adults have seasonal inshore/offshore migrations, with movements into shallow estuaries or coastal areas in the spring, estuarine residence through the summer, and movement out of estuaries (emigration) and nearshore habitats in late summer and fall, overwintering on the edge of the continental shelf. Summer Flounder are one of the most sought after commercial and recreational fishes along the Atlantic coast.

Summer Flounder are batch spawners, spawning more than once in a spawning season in response to environmental conditions. They spawn as they move from bays and estuarine grounds to the coasts and open ocean along the continental shelf. Summer Flounder spawn throughout the fall and winter as fish emigrate offshore or onto their wintering grounds. Offshore migration is correlated to cooling water temperatures and decreasing photoperiod in the fall.

Summer Flounder eggs (1 mm, or 0.04 in, in diameter) are transparent, pelagic, and buoyant and have been found at depths of 30 to70 m (98 to 230 ft) in the fall, as deep as 110 m (360 ft) in the winter, and between 10 and 30 m (33 to 98 ft) in the spring. Rate of Summer Flounder egg development is positively correlated with temperature, with increasing developmental rate occurring with increasing temperatures. Peak abundances for eggs in the fall occur at temperatures around 14 to 17 °C (57 to 63 °F). Higher temperatures and salinity increased the rate of embryonic development through hatching, but at high temperature and low salinity, inhibition of hatching and growth of embryos occurred. Conversely, a low temperature of 16 °C (61 °F) at low salinities enhanced larval survival indicating a low temperature–low salinity synergistic effect. Moderate to high survival under all salinities at 16 °C reflects an adaptability of the yolk sac larvae to inshore movement during the pelagic larval phase. Eggs hatch between 72 and 75 hours post fertilization with unpigmented eyes and no fin buds or mouth parts, surviving off the yolk-sac during initial development. After about two to three days, the yolk-sac is exhausted, and larvae have formed critical organs allowing them to begin consuming small planktonic food.

Larvae begin swimming upright and stay in this orientation until ingress into estuarine nursery grounds occurs during nighttime flood tides. Metamorphosis from larvae to juvenile generally takes between 30 to 70 days post hatch. Once metamorphosis occurs, individuals leave the water column, settle to the bottom and generally bury themselves in sediment to complete development to the juvenile stage. Ingress patterns in Beaufort Inlet, North Carolina, indicate larvae occurred from December through the end of the sampling period in May, but larvae were most abundant from February through April. In February, most were transforming larvae, but by March a portion were completely settled juveniles (11 to 21 mm [0.3 to 0.8 in] SL). In South Carolina, peak larval densities occurred in North Inlet estuary in February and March, in the Port Royal Sound from January through March, in the Charleston Harbor from January to April, and in the Chainey Creek area around the same time period. Notably, some Summer Flounder emigrate early in the summer or temporarily emigrate out of estuaries. These early migrations are likely not related to offshore spawning, but rather these individuals may occupy habitats on the inner continental shelf or move among coastal estuarine systems.

Juveniles are distributed in bays, sounds, and many estuaries throughout the species range during spring, summer, and fall. Patterns of juvenile estuarine use vary by latitude. Juveniles in southern waters generally overwinter in bays and sounds. In North Carolina sounds, juveniles often remain for 18 to 20 months. Juveniles located offshore return to coasts and bays in the spring and generally stay the entire summer. Once estuarine residency is established, individuals will only make minor movements as they become sedentary until fall migration. Estuarine waters west and northwest of Cape Hatteras, North Carolina, and in high salinity bays and tidal creeks of Core Sound, serve as significant nursery areas for juvenile Summer Flounder. Juveniles were most abundant in the relatively high salinities of the eastern and central parts of Pamlico Sound, all of Croatan Sound, and around inlets. Age-0 juveniles in the Pamlico Sound and Croatan Sound areas disappeared from the catch in late summer, suggesting that these fish are leaving estuarine habitats at that time. Juveniles located from Cape Hatteras northward enter the north-south, inshore-offshore movement of the Bight once exiting the estuaries. In contrast, those juveniles south of Cape Hatteras in the South Atlantic Bight, do not exhibit the same inshore-offshore, north-south migratory movement; juveniles > 11.8 in total length are rarely found in North Carolina estuaries, but larger fish are found around the inlets and along coastal beaches.

Scalloped Hammerhead Shark

The scalloped hammerhead shark is a circumglobal species that lives in coastal warm temperate and tropical seas. It occurs over continental and insular shelves, as well as adjacent deep waters. Scalloped hammerhead sharks are highly mobile and partly migratory, making migrations along continental margins as well as between oceanic islands in tropical waters.

Scalloped hammerhead sharks are highly mobile and partly migratory and are likely the most abundant of the hammerhead species. These sharks have been observed making migrations along continental margins as well as between oceanic islands in tropical waters.

Both juveniles and adult scalloped hammerhead sharks occur as solitary individuals, pairs, or in schools. Neonate and juvenile aggregations are more common in nearshore nursery habitats, such as Kāne'ohe Bayin Oahu, Hawaii, coastal waters off Oaxaca, Mexico, Guam’s inner Apra Harbor, coastal areas in the Republic of Transkei, and coastal intertidal habitats in Cleveland Bay, Australia. It has been suggested that neonates and juveniles inhabit these nursery areas for up to or more than a year as they provide valuable refuges from predation. In Mauritanian waters, there is an increase in abundance of hammerhead bycatch in pelagic trawlers during the summer months, with bycatch probability decreasing significantly during the winter and spring, as trade wind-induced upwellings caused sea surface temperatures to drop from summer maximums of 30°C to 18°C.

Hard Bottoms

Hard bottoms are defined as localized areas not covered by unconsolidated sediment, where the ocean floor consists of hard substrate. In the South Atlantic Bight, such hard bottoms vary in relief from high (higher than 2.0 m (6.6 feet) to low (lower than 0.5 m (1.6 feet) profile and range nearshore (within the 3-nautical-mile territorial sea limit) to beyond the continental shelf edge (more than 200 m [656 feet] [Moser et al. 1995]). Hard bottoms are also called live bottoms because they support a rich diversity of invertebrates such as corals, anemones, and sponges, which are refuges and food sources for fish and other marine life. They provide valuable habitat for reef fish such as black sea bass, red porgy, and groupers. Hard bottoms are also attractive to pelagic species such as king mackerel, amberjack, and cobia. While hard bottoms are most abundant in southern portions of North Carolina, they are along the entire coast. Storms play a major role in distributing hard bottom, benthic communities as they remove sediment accumulated from bioerosion and redistribute the ephemeral bottom sediment, exposing or burying hard bottom surfaces. The surficial sand sheet on the upper, flat, hard bottom is generally very thin, has an irregular distribution, and is highly mobile (Riggs et al., 1996).

Analysis of the side scan sonar data conducted by Geodynamics (Appendix B) identified thousands of tires, (labeled “Side-Scan Contacts”), in the area surveyed (Figure 3). Based on historical research, approximately 650,000 un-ballasted tires and other materials were deployed by the North Carolina Division of Marine Fisheries in the 1970s and 1980s to create a system of artificial reefs in North Carolina’s ocean waters. The reef in closest proximity to the borrow source is known as AR-370 and is located to the northwest of the borrow site (Figure 3). In addition to tires, AR-370 also contains materials such as concrete pipe sections and sunken vessels / barges. It is speculated, that over several decades, the steel cable, nylon rope, and polypropylene rope that bound tires together have deteriorated and failed. Storms and natural currents have swept these tires and binding materials well outside of the AR-370 vicinity and have redistributed orphaned tires over much of the borrow site. In conjunction with the side scan sonar survey a magnetometer/gradiometer survey was performed across the proposed borrow area. TAR also identified approximately 1,700 magnetic anomalies along with the tires strewn across the site (Appendix C). Virtually all were characterized by low-intensity short-duration signatures. These magnetic anomalies are thought to be remnants of steel cable used in construction of AR-370; however, this is a hypothesis based upon data interpretation and has not been confirmed. No hard bottoms were identified.

Overall, the project may result in adverse effects on EFH for Federally managed species, but adverse effects on EFH species, will largely be temporary and localized within the dredged footprint and beach nourishment area in the surf zone. In conclusion, the project is not anticipated to significantly impact EFH species or habitat that may be in the project area.

Alternative 1 (No Action) - No Emergency Repair:
This alternative would have no effect on EFH.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow

Areas:
The short-term impacts of dredging on fish include entrainment, physiological or behavioral changes due to human-made sounds, loss of prey/food web effects, loss of bottom substrate, and effects due to suspended and resuspended sediment plumes, sedimentation of the seafloor, and the potential release of contaminants. Hopper and hydraulic cutterhead dredges use hydraulic suction fields to obtain and transport unconsolidated sediments from aquatic ecosystems. These actions may result in the entrainment of fish and shellfish, as defined as the direct uptake of organisms due to the hydraulic suction field generated by a draghead or hydraulic cutterhead dredge (Reine et al. 1998). Relocation trawling may also result in the entrainment of fish.

From a finfish perspective, demersal species, early life stages (i.e., eggs, larvae), dormant life stages, spawning individuals, and habitats that are important for species' migration are predicted to be most impacted by dredging operations. As shown in Table 6, the proposed action may impact coastal demersals, coastal pelagics, highly migratory and especially snapper /grouper species to a greater extent due to dredging in the offshore borrow areas as compared to using the inlet borrow source. The proposed action may also impact sharks due to relocation trawling. Also, as noted in Section 3.3.1, the proposed action's timeframe contains critical life stages of brown shrimp, pink shrimp, blue crab, gag grouper, summer flounder and southern flounder (Table 4). Other pelagic species and life stages are predicted to be minimally impacted. Given the relatively small size of the impacted area relative to the large geographic ranges of transitory fishes, the proposed activities are likely to have only minor impacts on the populations of finfish evaluated in this analysis.

Pelagic Sargassum is positively buoyant and, depending on the prevailing surface currents, would remain on the continental shelf for extended periods or be cast ashore. Therefore, pelagic Sargassum species could be transported inshore from the Gulfstream and drift through the vicinity of the dredge plant operation. Because it occurs in the upper few feet of the water column, it is not subject to effects from dredging or sediment disposal activities associated with the proposed action (SAFMC, 1998); thus, effects from the dredging or placement operations would not be expected to be significant.

Dredging and beach placement could result in minor and short-term suspended sediment plumes and related turbidity in the marine water column, and the release of soluble trace constituents from the sediment. Overall water quality impacts of the proposed action would be expected to be short-term and minor. The various life stages of fish species associated with marine and estuarine resources dependent on good water quality would not be expected to experience significant adverse effects from water quality changes. Therefore, the proposed action would result in no significant effects to EFH.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area:
Implementation of Alternative 3 would directly affect the estuarine water column in Masonboro Inlet and Banks Channel and may result in short-term minor effects on

estuarine life cycle requirements of managed species in the South Atlantic Region. Short-term, elevated turbidity levels could also occur during the renourishment operation and could be transported outside the immediate placement area via longshore and tidal currents. Turbidity associated with beach fill placement operations could extend into Masonboro Inlet/Banks Channel and the estuarine water column from longshore currents and tidal influx, however these effects are expected to be minimal. As shown in Table 6, Alternative 3 may impact coastal demersals, coastal pelagics, sharks and snapper /grouper species. As compared to the proposed plan, this alternative will have a shorter construction timeframe, no impacts to highly migratory species and much fewer impacts to shark and snapper/grouper species. This alternative also removes the impacts from hopper dredging and the associated relocation trawling. Alternative 3 would not be expected to cause any significant adverse impacts to EFH or HAPC for managed species identified in the Fisheries Management Plan Amendments affecting the South Atlantic Area. Physical and biological impacts to EFH would be short-term and localized on an individual and cumulative effects basis.

3.6 Birds

Birds common to the nearshore ocean in the project area are loons, grebes, gannets, cormorants, scoters, red-breasted mergansers, gulls, and terns (Sauer et al., 2008). The habitat and food source of such seabirds is the marine environment, whether coastal, offshore or pelagic. They can be divided into four groups by their feeding strategies, which are reflected in their anatomy, physiology, and habitat niche: surface feeders, surface swimmers/pursuit divers, plunge-divers, and scavengers and pirates (i.e., steal from other birds).

The beaches and inlets of the project vicinity are heavily used by migrating shorebirds. However, dense development and high public use of project area ocean front beaches may reduce their value to shorebirds. Along the ocean beach, black-bellied plovers, ruddy turnstones, whimbrels, willets, red knots, semi-palmated sandpipers, and sanderlings may be found (Sauer et al., 2008). The dunes of the project area support fewer numbers of birds but can be very important habitats for resident species and for other species of songbirds during periods of migration. Other birds occurring in the area are mourning doves, swallows, fish crows, starlings, meadowlarks, redwinged blackbirds, boat tailed grackles, and savannah sparrows (Sauer et al., 2008).

The black skimmer, least tern, gull-billed tern, common tern and American oystercatcher are state-listed species of concern for New Hanover County, North Carolina, and are found on Wrightsville Beach year-round during both the breeding season and during migration, with peak abundance occurring in the summer months. Terns feed by diving from the air on insects and small fish, the black skimmer feeds on shrimp or small fish by flying just above the water with the tip of the long lower mandible shearing the surface and the American Oystercatcher forages by walking in the shallow water searching for shellfish and marine worms by sight. All these bird species may use Wrightsville Beach for roosting, foraging, breeding, and nesting (Potter et al., 1980).

Since 2009, least terns, black skimmers, American oystercatchers, common terns and willets have gathered at the south end of Wrightsville Beach, outside but adjacent to the project area, to find mates and raise their young. Because it hosts large numbers of birds, the site serves as a significant nesting site for beach-nesting species in North Carolina. As many as 20 percent of the state's least terns and black skimmers have nested there, and their success helps maintain healthy populations in the state and in the region (NC Audubon.org). To protect this bird nesting area, the NC Wildlife Resources Commission discourages beach work between April 1 and August 31.

Alternative 1 (No Action) - No Emergency Repair:
This alternative would not repair the eroded beach, negatively impacting foraging and resting areas along the ocean front.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas:
Dredging and beach placement would be restricted to the timeframe of December 1 through March 31 for hopper dredge use and November 16 through April 30 for a hydraulic cutterhead. It would take an estimated 110 days if completed by one hopper; 55 days if done by 2 hoppers or 50 days if done by a hydraulic cutterhead dredge. For the beach placement, bulldozers would be used to construct seaward, shore-parallel dikes to contain the material on the beach, and to shape the beach to the appropriate renourishment cross-section template.

Beach nourishment activities could temporarily affect the roosting and intertidal macro-fauna foraging habitat; however, recovery often occurs within one year if nourishment material is beach quality. Due to most of the birds utilizing the beachfront being displaced by development pressures and heavy recreational use along the beach, impacts would be minor and temporary. Therefore, because (1) areas of diminished prey base are temporary and isolated, (2) recovery occurs within one year since material is beach quality, (3) adjacent unaffected foraging and roosting habitat would be available throughout the project and (4) the heavy recreational use of the beaches during the summer months would reduce the availability of nesting, foraging and roosting habitat this alternative would have no significant effects to birds.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area:
Impacts of Alternative 3 would be similar to the proposed action, with some differences, as described below. To the greatest extent practicable, periodic renourishment with a cutterhead dredge would occur from November 16 to March 31, taking approximately 45 days. Accretion at the southern tip of Wrightsville Beach frequently extends into the Masonboro Inlet/Banks Channel borrow area (Figure 4). The accreted material has been and would continue to be removed to prevent filling of the navigation channel and for placement on Wrightsville Beach. The tip of the spit area removed has historically re-accreted in approximately four years, therefore bird habitat lost would slowly reappear. Birds that use the inlet as feeding grounds would be temporarily impacted

during dredging activities and pipeline running from the inlet to Wrightsville Beach, but would be expected to return following dredging; however, pipeline placement would be coordinated with the appropriate resource agencies to minimize impacts to the significant nesting site at the southern end of Wrightsville Beach.

This alternative is not expected to significantly affect breeding and nesting shorebirds or colonial waterbirds in the project area.

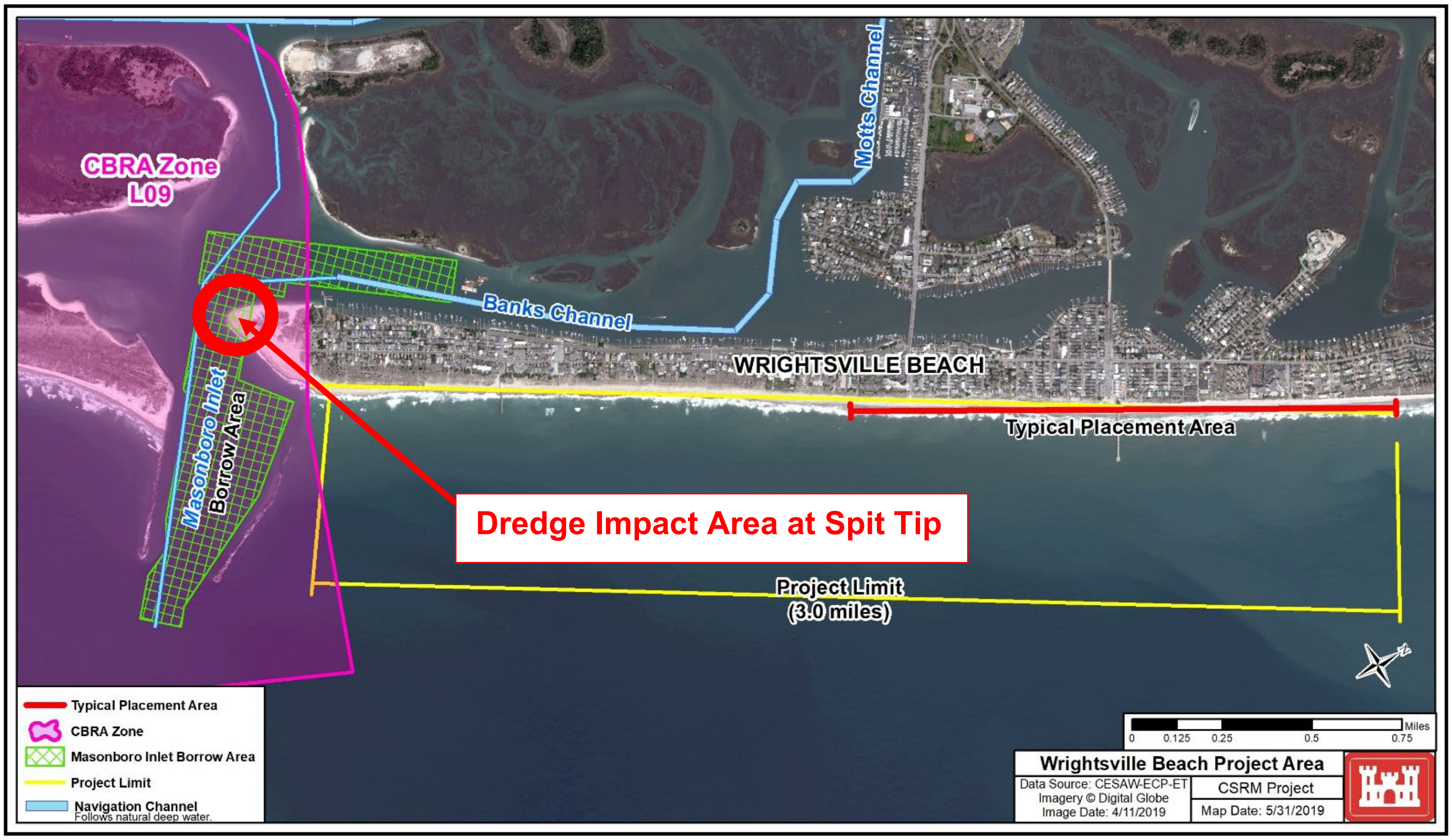

Figure 4. Masonboro Inlet/Banks Channel Borrow Area Alternative 3 Spit Impacts

3.7 Air Quality

The Wilmington Regional Office of the North Carolina Department of Environmental Quality (NCDEQ), Division of Air Quality has air quality jurisdiction for the project area. The ambient air quality for New Hanover County has been determined to be in compliance with the National Ambient Air Quality Standards and is designated an attainment area for Ozone (O_3), Particulates ($PM_{2.5}$), Carbon Monoxide (CO), and Sulfur Dioxide (SO2) (N.C. Division of Air Quality, 2021; https://deq.nc.gov/about/divisions/air-quality/air-quality-planning/attainment); therefore, a conformity determination is not required.

Reduction of greenhouse gas emissions is also a priority for the Wilmington District with the Executive Order (EO) 13990: *Protecting Public Health and the Environment and*

Restoring Science To Tackle the Climate Crisis, January, 2021. As discussed below, Wilmington District USACE has considered how the repair of the Wrightsville Beach CSRM project will contribute to greenhouse gas emissions within the surrounding area.

Greenhouse gases absorb infrared radiation, thereby trapping heat and making the planet warmer. The most important greenhouse gases directly emitted by humans include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and several other fluorine-containing halogenated substances. Although CO_2, CH_4, and N_2O occur naturally in the atmosphere, human activities have changed their atmospheric concentrations. From the pre-industrial era (i.e., ending about 1750) to 2017, concentrations of these greenhouse gases have increased globally by 45, 164, and 22 percent, respectively.

Gases in the atmosphere can contribute to climate change both directly and indirectly. Direct effects occur when the gas itself absorbs radiation. Indirect radiative forcing occurs when chemical transformations of the substance produce other greenhouse gases, when a gas influences the atmospheric lifetimes of other gases, and/or when a gas affects atmospheric processes that alter the radiative balance of the earth.

Alternative 1 (No Action) - No Emergency Repair:
This alternative would have no effect on air quality.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas:
Dredging and beach placement would occur during the timeframe from December 1 through March 31 and would take an estimated 110 days if completed by one hopper; 55 days if done by 2 hoppers or 50 days if done by a hydraulic cutterhead dredge (November 16-March 31). Temporary increases in exhaust emissions from the dredge, beach moving and other renourishment equipment are expected, however, the emissions produced would be similar to that produced by other large pieces of machinery and should be readily dispersed. A conformity determination is not required for this project because it is located in an attainment area, the direct and indirect emissions from this alternative fall below the prescribed de minimis levels, and therefore will have no effect on air quality. Ozone is North Carolina’s most widespread air quality problem, particularly during the warmer months. High ozone levels generally occur on hot sunny days with little wind, when pollutants such as nitrogen oxides and hydrocarbons react in the air. The proposed action would have a greater duration of repair time using heavy equipment resulting in a greater impact to ozone as compared to no action and alternative 3, but emission increases would be minor, temporary and of relatively short duration.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area:
Impact of Alternative 3 would be similar to the proposed action. Temporary increases in exhaust emissions from the cutterhead dredge and other emergency repair equipment would be expected, however, the emissions produced would be similar to that produced by other large pieces of machinery and should be readily dispersed. The emergency

repair using the Masonboro Inlet borrow source would take approximately 45 days and would occur during cold weather months. All dredges must comply with the applicable EPA standards. The direct and indirect emissions from this alternative fall below the prescribed de minimis levels, and therefore will have no effect on air quality.

3.8 Noise

Typical noise associated with a beach area, especially a recreational beach, can vary, but is generally fairly loud due to wind, boats and beachgoers. Therefore, the noise associated with dredging and placement would be minor, temporary and short-term, and therefore not significant.

Current Noise Environment

Noise levels at Wrightsville Beach are variable and can greatly change with the change in the seasons and the influx of tourist traffic. Markedly, there are considerably more people and vehicular traffic present on Wrightsville Beach during the peak tourist season in summer months, than in the winter months of the year. Common noise generating activities include: vehicular traffic, music, shouting and occasional flyby of small planes and helicopters.

Additionally, open-water coastal environment has a number of underwater ambient noise sources such as commercial and recreational vessel traffic, dredges, wharf/dock construction (e.g., pile driving), natural sounds (e.g., storms, biological, waves), and human produced sounds (esp. near crowded areas on the beach, such as piers and restaurants).

Effects of Noise from Dredging and Beach Placement

To better assess potential species effects (i.e., disturbance of communication among marine mammals) associated with dredge specific noise from navigation maintenance, deepening, or borrow source dredging operations, Clarke et al. (2002) performed underwater field investigations to characterize sounds emitted by bucket, hydraulic cutterhead, and hopper dredge operations. A summary of results from the study are presented below and are a first step toward developing a dredge sounds database that will encompass a range of dredge plant sizes and operational features.

Hydraulic Cutterhead Dredge

Noise generated by a hydraulic cutterhead dredge is continuous and muted and results from the drill head rotating within the bottom sediment and from the pumps used to transport the dredged material to the placement area. The majority of the sound generated was from 70 to 1,000 hertz (Hz) and peaked at 100 to 110 decibel (dB) range. Although attenuation calculations were not completed, reported field observations indicate that the hydraulic cutterhead dredge became almost inaudible at about 500 meters (Clarke et al., 2002).

Hopper Dredge

The noise generated from a hopper dredge is similar to a hydraulic cutterhead dredge except there is no rotating drill head. The majority of the noise is generated from the dragarm sliding along the bottom, the pumps filling the hopper, operation of the ship engine/propeller and connection and material movement through the pumpout station. Similar to the hydraulic cutterhead dredge, most of the produced sound energy fell within the 70- to 1,000-Hz range; however peak pressure levels were at 120 to 140 dB (Clarke et al., 2002).

Dredging produces broadband and continuous, low-frequency sound (below 1 kHz) and estimated source sound pressure levels range between 168 and 186 dB re 1 µPa at 1 m, which can trigger avoidance reaction in marine mammals and marine fish. In some instances, physical auditory damage can occur. Auditory damage is the physical reduction in hearing sensitivity due to exposure to high-intensity sound and can be either temporary (temporary threshold shift) or permanent (permanent threshold Shift) depending on the exposure level and duration. Other than physical damage, the key auditory effect is the increase in background noise levels, such that the ability of an animal to detect a relevant sound signal is diminished, which is known as *auditory masking*. Masking marine mammal vocalizations used for finding prey, navigation and social cohesion could compromise the ecological fitness of populationswickli.

Alternative 1 (No Action) - No Emergency Repair
This alternative would have no effect on noise.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas:
Dredging and beach placement would occur within the timeframe of December 1 through March 31 and would take an estimated 110 days if completed by one hopper; 55 days if done by 2 hoppers or 50 days if done by a hydraulic cutterhead dredge. Noise in the outside environment associated with beach repair activities would be expected to minimally exceed normal ambient noise in the project area, however, repair noise would be attenuated by background sounds from wind and surf. Though noise generated from dredging equipment is within the hearing range of sea turtles, marine mammals, and fishes, no injurious effects would be expected because they can move from the area, and the significance of the noise generated by the dredging equipment dissipates with an increasing distance from the noise source.

On the basis of the ability of marine mammals to move away from the immediate noise source, noise generated by hydraulic cutterhead and hopper dredging activities would not be expected to affect the migration, nursing/breeding, feeding/sheltering or communication of large whales. Although behavioral effects are possible (i.e., a whale changing course to move away from a vessel), the number and frequency of vessels present in a given project area would be small, and any behavioral impacts would be expected to be minor. Also, the time of year in which the noise occurs can have a varying effect due to the increased presence and numbers of species in the project area in the spring and summer months. This is especially true for sea turtles, anadromous fish and marine mammals. Species present in the project area may be affected by the increased noise; however, mobile species could easily leave the area.

Emergency repairs could cause a temporary increase of noise and interference with recreational activities. Placement of beach fill would result in temporary use of a dredge pipeline, bulldozers, and other equipment on the beach. These objects would detract from the normal appearance of the beach as well as create elevated levels of noise. Also, beachgoers may experience some interruption or interference during work periods, but the degenerated, eroded conditions of the beach already present some recreational constraints. However, because work would be conducted in relatively small areas at a time, recreational and aesthetic impacts would be localized and temporary.

Impacts would be considered minor and short-term and noise levels would vary as construction moves along the beach. Overall, noise impacts would not be significant.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area:
Impacts of Alternative 3 would be similar to the proposed action. The emergency repair using the Masonboro Inlet borrow source would take approximately 45 days and would occur during cold weather months.

3.9 Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531–1543), provides a program for the conservation of threatened and endangered (T&E) plants and animals and the habitats in which they are found. The lead Federal agencies for implementing the ESA are the US Fish and Wildlife Service (USFWS) (http://www.fws.gov/) and the National Oceanic and Atmospheric Administration National Marine Fisheries Service (http://www.nmfs.noaa.gov/). In accordance with Section 7 (a)(2) and 7(d) of the ESA, this EA is being coordinated by the USACE and BOEM with the USFWS and NMFS to ensure that effects of the proposed project would not jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat of such species.

The USACE completed informal consultation with the USFWS on the development of the Wrightsville Beach Validation Report. Formal consultation on the Wrightsville Beach, North Carolina, Coastal Storm Risk Management project was completed in 2016 when the completion of Wrightsville Beach Coastal Storm Damage Reduction Project Batched Biological Opinion (BO) dated August 4, 2016. The USACE and BOEM submitted a Biological Assessment to the USFWS and received the Wrightsville Beach Coastal Storm Risk Management Emergency Repairs Using Offshore Borrow Area Biological Opinion dated January 5, 2023 (Appendix E) issued for this one-time emergency repair. A list of threatened and endangered (T&E) species for the project area was obtained from the USFWS IPAC website (**https://ecos.fws.gov/ipac/**). Table 7 includes T&E species that could be present in the area based upon their historical occurrence or potential geographic range. However, the actual occurrence of a species in the area depends upon the availability of suitable habitat, the season of the year relative to a species' temperature tolerance, migratory habits, and other factors. Further descriptions of T&E species most likely to be encountered within the project area are also listed below along with details about potential impacts and avoidance measures which would be implemented for the proposed action or alternative.

Regarding T&E species under the purview of NMFS Protected Resources Division (PRD), the proposed action activities is dredging that is covered by the South Atlantic Regional Biological Opinion (SARBO) issued by the NMFS on March 27, 2020, as revised on July 30, 2020 (NMFS 2020). The 2020 SARBO can be located at https://www.fisheries.noaa.gov/content/endangered-species-act-section-7-biological-opinions-southeast. Formal consultation with NMFS PRD was not required for this project.

The species and critical habitats under the purview of the NMFS are the following:

Sea turtles [green (North Atlantic Distinct Population Segment (DPS)(*Chelonia mydas*), loggerhead (Northwest Atlantic DPS) (*Caretta caretta*), leatherback (*Dermochelys coriacea*), Hawksbill (*Eretmochelys imbricate*), and Kemp's ridley (*Lepidochelys kempii*)]; Blue Whale (*Balaenoptera musculus); Sei Whale (Balaenoptera Borealis); Sperm whale (Physeter Macrocephalus); Finback whale* (*Balaenoptera physalus);* North Atlantic right whale (*Eubalaena glacialis*); shortnose sturgeon (*Acipenser brevirostrum*); Atlantic sturgeon (Carolina DPS)(*Acipenser oxyrinchus oxyrinchus*); Giant Manta Ray (*Manta birostris*); and Smalltooth sawfish U.S. DPS (*Pistis pectinata*).

The project will comply with all relevant SARBO project design criteria (PDC) requirements. PDC requirements include training and education of on-site personnel (vessel captain, crew, etc.) of project requirements, and completing work in a manner that will minimize effects to species. This includes, but is not limited to, the list provided above. All work, including equipment, staging areas, and placement of materials, will be done in a manner that does not block access of ESA-listed species from moving around or past construction. Equipment will be staged, placed, and moved in areas and ways that minimize effects to species and resources in the area, to the maximum extent possible. All work that may generate turbidity will be completed in a way that minimizes the risk of turbidity and sedimentation to the maximum extent practicable. Beach placement will be conducted in a manner that minimizes turbidity in nearshore waters by using methods that promote settlement before water returns to the water body (i.e., shore parallel dikes). Turbidity and marine sedimentation will be further controlled using land-based erosion and sediment control measures to the maximum extent practicable. Land-based erosion and sediment control measures will (1) be inspected regularly to remove excess material that could be an entanglement risk, (2) be removed promptly upon project completion, (3) and will not block entry to or exit from designated critical habitat for ESA-listed species. Lighting associated with beach placement activities will be minimized through reduction, shielding, lowering, and/or use of turtle friendly lights, to the extent practicable without compromising safety, to reduce potential disorientation effects on female sea turtles approaching the nesting beaches and sea turtle hatchlings making their way seaward from their natal beaches. The conservation measures will be revaluated annually and project changes, including time and/or equipment, may be altered, based on new information and experience. The proposed use of additional and finer screens to avoid tires and debris on the beach may reduce the ability of PSOs to accurately monitor potential take. Visual observers would be stationed at the inflow box and on the beach to quickly identify any take.

Table 7. Federally Threatened and Endangered Species Potentially Present in Project Area.

		Effects Determination for the Proposed Action	
Species	**Status**	**Beach Placement Activities (USFWS)**	**In-Water Activities (NMFS)******
Mammals			
Blue, Finback, Sei and Sperm Whales	Endangered	No effect	MANLAA*
North Atlantic Right Whale /*Eubaleana glacialis*	Endangered	No effect	MANLAA
Northern Long-eared Bat/ *Myotis septentrionailis*	Threatened	No effect	No effect
West Indian Manatee /*Trichechus manatus*	Threatened	MALAA	MALAA
Reptiles			
American Alligator/ Alligator mississippiensis	SAT***	No effect	No effect
Green Sea Turtle (NA DPS)/*Chelonia mydas*	Threatened	MALAA**	MALAA**
Hawksbill Sea Turtle /Eretmochelys imbricata	Endangered	MALAA	MANLAA
Kemp's Ridley Sea Turtle /*Lepidochelys kempii*	Endangered	MALAA	MALAA
Leatherback Sea Turtle /*Dermochelys coriacea*	Endangered	MALAA	MALAA
Loggerhead Sea Turtle (NWA DPS)/*Caretta caretta*	Threatened	MALAA	MALAA
Fish			
Atlantic Sturgeon (Carolina DPS)/Acipensercipenser oxyrhynchus oxyrhynchus	Endangered	No effect	MALAA
Shortnose Sturgeon /Acipenser brevirostrum	Endangered	No effect	MALAA
Giant Manta Ray /*Manta birostris*	Threatened	No effect	MALAA
Smalltooth Sawfish (U.S. DPS)/*Pristis pectinata*	Endangered	No effect	MALAA
Flowering Plants			
Cooley's Meadowrue/ *Thalictrum cooleyi*	Endangered	No effect	No effect
Golden Sedge/ *Carex lutea*	Endangered	No effect	No effect
Rough-leaved Loosestrife/ lysimachia asperulaefolia	Endangered	No effect	No effect
Seabeach Amaranth /Amaranthus pumilus	Threatened	MALAA	No effect
Birds			
Eastern Black Rail/ Laterallus jamaicensis ssp. jamaicensis	Threatened	MANLAA	No effect
Piping Plover /Charadrius melodus	Threatened	MALAA	No effect
Red Knot /Calidris canutus rufa	Threatened	MALAA	No effect
Red-cockaded Woodpecker/ *Picoides borealis*	Endangered	No effect	No effect
Snails			
Magnificent Ramshorn/ Planorbella magnifica	Candidate	No effect	No effect
Critical Habitats			
North Atlantic Right Whale		No effect	No effect
Loggerhead Sea Turtle		MANLAA	No effect
Atlantic Sturgeon		No effect	No effect
Piping Plover		MANLAA	No effect

*May Affect Not Likely to Adversely Affect
**May Affect, Likely to Adversely Affect
***Similarity of Appearance-Threatened
****Determinations are derived directly for Table 8 of the 2020 SARBO

3.9.1 Large Whales – Blue Whale, Finback Whale, North Atlantic Right Whale (NARW), Sei Whale, and Sperm Whale

Blue whale, finback whale, North Atlantic right, sei whale, and sperm whales all occur infrequently in the ocean off the coast of North Carolina. Of these, only the NARW routinely come close enough inshore to encounter the project area.

The NARW continues to be one of the most critically endangered populations of large whales in the world. NMFS estimates fewer than 350 are known alive. There are 6 major habitats or congregation areas for the western NARW; these are the coastal waters of the southeastern United States, the Great South Channel, Georges Bank/Gulf of Maine, Cape Cod and Massachusetts Bays, the Bay of Fundy, and the Scotian Shelf. The South Atlantic Division of the USACE has been conducting aerial reporting and tracking surveys from Virginia to Florida Nov 15 to April 15 annually. While it usually winters in the waters between Georgia and Florida, the NARW can, on occasion, be found in the waters off North Carolina. The occurrence of NARWs in the State's waters is usually associated with spring or fall migrations.

When defining critical habitat for right whales, the NMFS considered the physical and/or biological features of foraging and calving habitats. The physical and biological features of right whale calving habitat that are essential to the conservation of the North Atlantic right whale are: (1) Calm sea surface conditions of Force 4 or less on the Beaufort Wind Scale; (2) sea surface temperatures from a minimum of 7 °C, and never more than 17 °C; and (3) water depths of 6 to 28 meters, where these features simultaneously co-occur over contiguous areas of at least 231 nm^2 of ocean waters during the months of November through April. When these features are available, they are selected by right whale cows and calves in dynamic combinations that are suitable for calving, nursing, and rearing, and which vary, within the ranges specified, depending on factors such as weather and age of the calves.

The NMFS's Unit 2 contains the essential features for calving right whales in the southeastern U.S (Figure 5). This area comprises waters of Brunswick County, North Carolina; Horry, Georgetown, Charleston, Colleton, Beaufort, and Jasper Counties, South Carolina; Chatham, Bryan, Liberty, McIntosh, Glynn, and Camden Counties, Georgia; and Nassau, Duval, St. John's, Flagler, Volusia, and Brevard Counties, Florida.

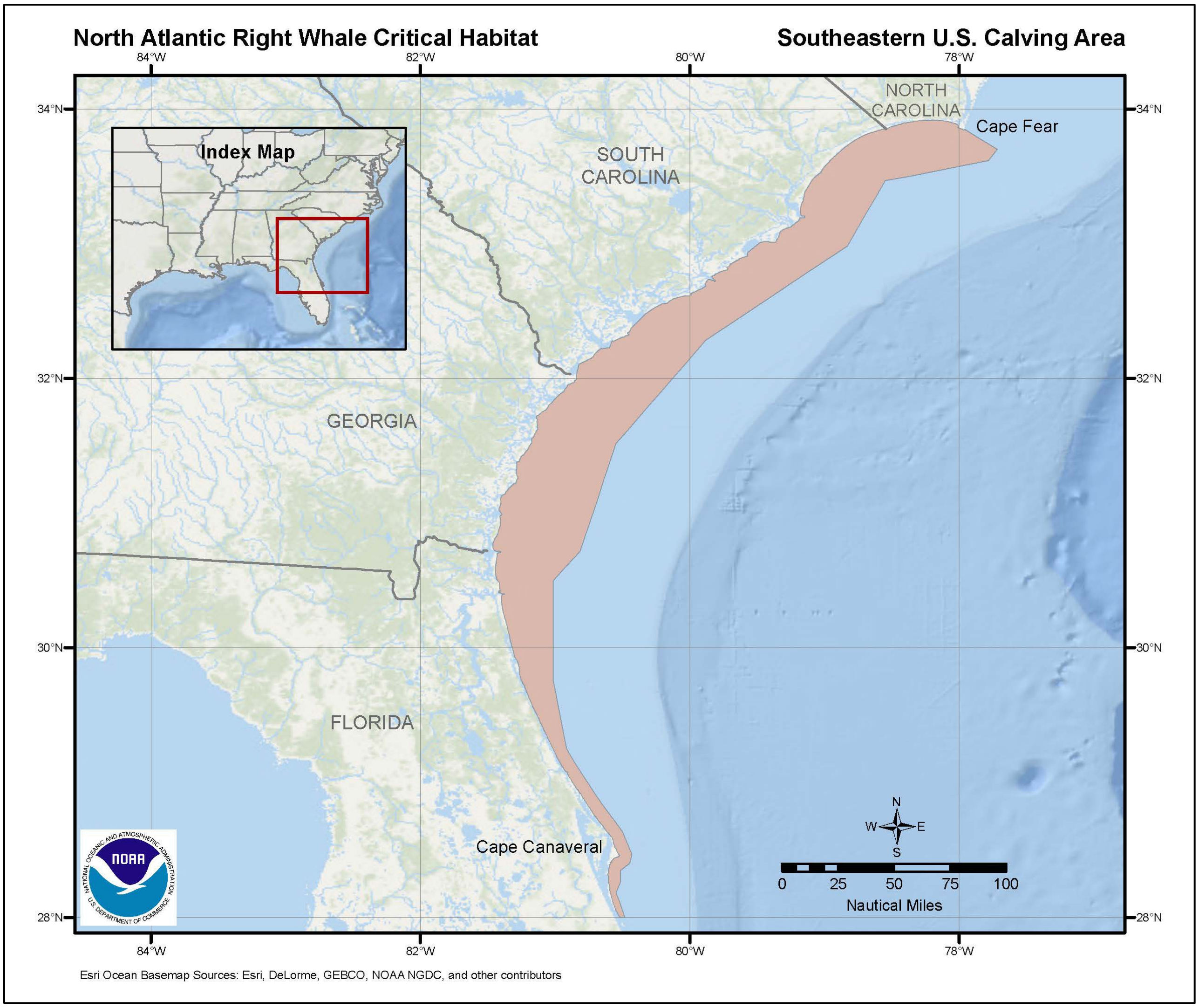

Figure 5. North Atlantic Right Whale Critical Habitat

Alternative 1 (No Action) - No Emergency Repair
This alternative would have no effect on the NARW. There is no NARW critical habitat in the project area, therefore the project will have no effect on NARW critical habitat.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
Of the six species of whales being considered, only the NARW would normally be expected to occur within the project area during the emergency repair. Therefore, this alternative is not likely to adversely affect the blue whale, finback whale, sei whale, and sperm whale.

Hopper dredging for 110 days for one hopper, or 55 days for two hoppers, three to four miles offshore and the transit to and from the pumpout location has the potential to cause NARW take trough vessel strikes. Dredging during the December 1 through March 31 timeframe (hopper) or November 16 through April 30 (hydraulic cutterhead) would increase the risk of strikes during the times when they are typically seen in the nearshore waters of North Carolina (January through March). All recommendations mentioned in the 2020 SARBO (**https //www.fisheries.noaa.gov/content/endangered-species-act-section-7-biological-opinions-southeast)** would be followed in order to reduce the potential for accidental collision (i.e., contractor pre-project briefings, large whale observers, whale alerts from NMFS aerial surveys, appropriate vessel speed restrictions, crew education, and course alteration procedures, etc.). The proposed use of additional and finer screens to avoid tires and debris on the beach may reduce the ability of PSOs to accurately monitor potential take. Visual observers would be stationed at the inflow box and on the beach to quickly identify any take. The effect determination as identified in the 2020 SARBO, is the proposed action may affect, but is not likely to adversely affect the NARW and humpback whale species. There is no NARW critical habitat in the project area, therefore the project will have no effect on NARW critical habitat.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
Impacts of this alternative would be similar to the proposed action; however, the risk of vessel strikes in the inlet with a hydraulic cutterhead dredge is less than the potential risk of one or two hoppers dredges offshore and transiting back and forth to the sand pumpout location. This alternative would also further reduce the risk due to fewer total dredging days (45) as compared to the proposed action (likely 110).

3.9.2 West Indian Manatee

Manatees are a sub-tropical species with little tolerance for cold. Though they are generally restricted to warm inland and coastal waters of Florida, in warmer months they may be found throughout the United States. North Carolina is one location along the Southeast coast where the manatee is an occasional summer resident. The species can be found in shallow (5 feet to usually <20 feet), slow-moving rivers, estuaries, saltwater bays, canals, and coastal areas. The West Indian manatee is herbivorous and eats aquatic plants such as hydrilla, eelgrass, and water lettuce.

Manatees are thermally stressed at water temperatures below 18ºC (64.4ºF); therefore, during winter months, when ambient water temperatures approach 20ºC (68ºF), the U.S. manatee population confines itself to the coastal waters of the southern half of peninsular Florida and to springs and warm water outfalls as far north as southeast Georgia. During the summer months, sightings drop off rapidly north of Georgia and are rare north of Cape Hatteras. However, they are sighted infrequently in southeastern North Carolina with most records occurring in July, August, and September, as they migrate up and down the coast. The Species is considered a seasonal inhabitant of North Carolina with most occurrences reported from June through October.

Alternative 1 (No Action) - No Emergency Repair
This alternative would have no effect on manatees.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
Guidelines for Avoiding Impacts to the West Indian Manatee (USFWS, 2017)

precautionary measures will be implemented for transiting vessels associated with the project. The habitat and food supply of the manatee will not be significantly impacted. Because there is a very low number of manatees present in NC coastal waters, the effects determination for this alternative is may affect, likely to adversely affect (MALAA).

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
Impacts of this alternative would be similar to the proposed action; however, the risk of vessel strikes in the inlet with a hydraulic cutterhead dredge is very low versus one or two hopper dredges offshore, transiting back and forth to the pumpout station. This alternative would also further reduce the risk due to fewer total dredging days (45) as compared to the proposed action (likely 110).

3.9.3 Sea Turtles
All five species of sea turtles identified above are known to occur in both the estuarine and oceanic waters of North Carolina. Loggerhead Northwest Atlantic (NWA) Distinct Population Segment (DPS), green North Atlantic (NA) DPS, and Kemp's ridley sea turtles are known to frequently use coastal waters offshore of North Carolina as migratory travel corridors and commonly occur at the edge of the continental shelf when they forage around coral reefs, artificial reefs, and boat wrecks.

Results from satellite tracking survey of male loggerhead sea turtles aggregated for mating in the Port Canaveral, FL, shipping entrance channel suggest that residents and transients co-occurred in near shore waters during April and mid-May, after which time residents moved offshore to deeper waters (>26m) and transients dispersed to multiple locations along the U.S. East Coast, including Cape Hatteras, NC. These results are consistent with other studies tracking male loggerhead sea turtles suggesting that that Cape Hatteras, NC may represent a seasonally important landmark for adult male loggerheads. Male turtles appear to migrate to Cape Hatteras in the fall before over-wintering near the edge of the continental shelf to the east/southeast of Cape Fear, NC.

Of the five species of sea turtles considered for this project, only the loggerhead sea turtle (*Caretta caretta*), the green sea turtle (*Chelonia mydas*), and the leatherback sea turtle (*Dermochelys coriacea*) nest regularly on North Carolina beaches and have the potential to nest within the project area (Figure 6).

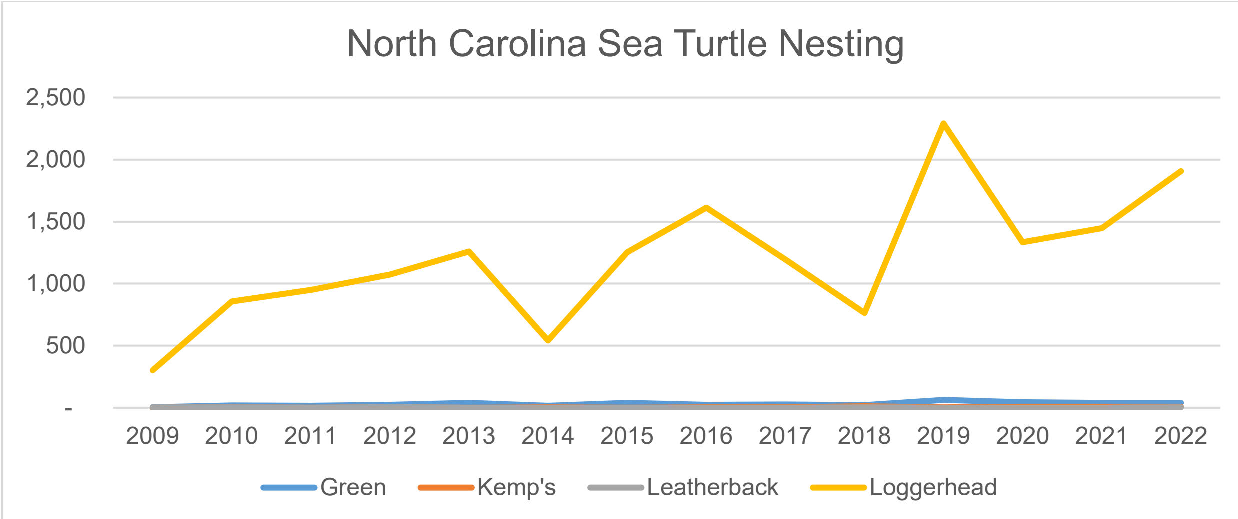

Figure 6. North Carolina Sea Turtle Nesting

With a few exceptions, the entire Kemp's ridley population nests on the approximately 15 miles of beach in Mexico between the months of April and June. The hawksbill sea turtle nests primarily in tropical waters in south Florida and the Caribbean. Considering the infrequency of Kemp's ridley nesting occurrence throughout North Carolina and the lack of historical nesting of hawksbill sea turtles, these species are not anticipated to nest within the project area. The loggerhead is considered to be a regular nester in the state. Green sea turtle nesting is infrequent and primarily limited to Florida's east coast (300 to 1,000 nests reported annually).

There are inherent changes in beach characteristics as a result of mechanically placing sediment on a beach from alternate sources. The change in beach characteristics often results in short-term decreases in nest success and/or alterations in nesting processes. Based on post-renourishment monitoring, in most cases, nesting success decreases during the year following renourishment as a result of escarpments obstructing beach accessibility, altered beach profiles, and increased compaction. However, when done properly, beach renourishment projects may mitigate the loss of nesting beach when the alternative is severely degraded or non-existent habitat. Though significant alterations in beach substrate properties may occur with the input of sediment types from other sources, re-establishment of a berm and dune system with a gradual slope can enhance nesting success of sea turtles by expanding the available nesting habitat beyond erosion and inundation prone areas.

Wrightsville Beach consists of approximately 4.5 linear miles of available nesting habitat. Table 8 shows the total number of recorded nesting activity on these beaches from 2009 to 2021. A total of 89 nests were laid within the project areas from 2009 - 2021.

Table 8. North Carolina Wildlife Resources Commission's Historic Data of Turtle Nests on Wrightsville Beach (2021,Seaturtle.org).

Year	Number of Nests
2009	1
2010	1
2011	3
2012	3
2013	9
2014	1
2015	4
2016	15
2017	10
2018	2
2019	11
2020	15
2021	14

During all hopper dredging activities, the use of turtle deflecting dragheads, inflow and/or overflow screening, and NMFS certified turtle observers will be implemented. The proposed use of additional and finer screens to avoid tires and debris on the beach may reduce the ability of PSOs to accurately monitor potential take. Visual observers would be stationed at the inflow box and on the beach. Additionally, all dredging either by hopper or hydraulic cutterhead would be completed in compliance with the 2020 SARBO and all applicable SARBO appendices.

Critical Habitat: The NMFS identified physical biological features (PBF)s of habitat essential for the conservation of the loggerhead sea turtle, the Primary Constituent Elements (PCE)s that support the PBFs, and the specific areas identified using these PBFs and PCEs. A description of the means used to identify PBFs, PCEs and specific areas can be found in the final rule 79 FR 39855, August 11, 2014.

Of the five categories of habitat identified in Loggerhead critical habitat, only Nearshore Reproductive Habitat occurs in the project area (Figure 7). Nearshore Reproductive Habitat is described as the PBFs of nearshore reproductive habitat as a portion of the nearshore waters adjacent to nesting beaches that are used by hatchlings to egress to the open-water environment as well as by nesting females to transit between beach and open water during the nesting season. Figure 8 shows the Nearshore Reproductive Habitat areas specific to southeastern North Carolina that are located within close proximity to the Wrightsville Beach project area.

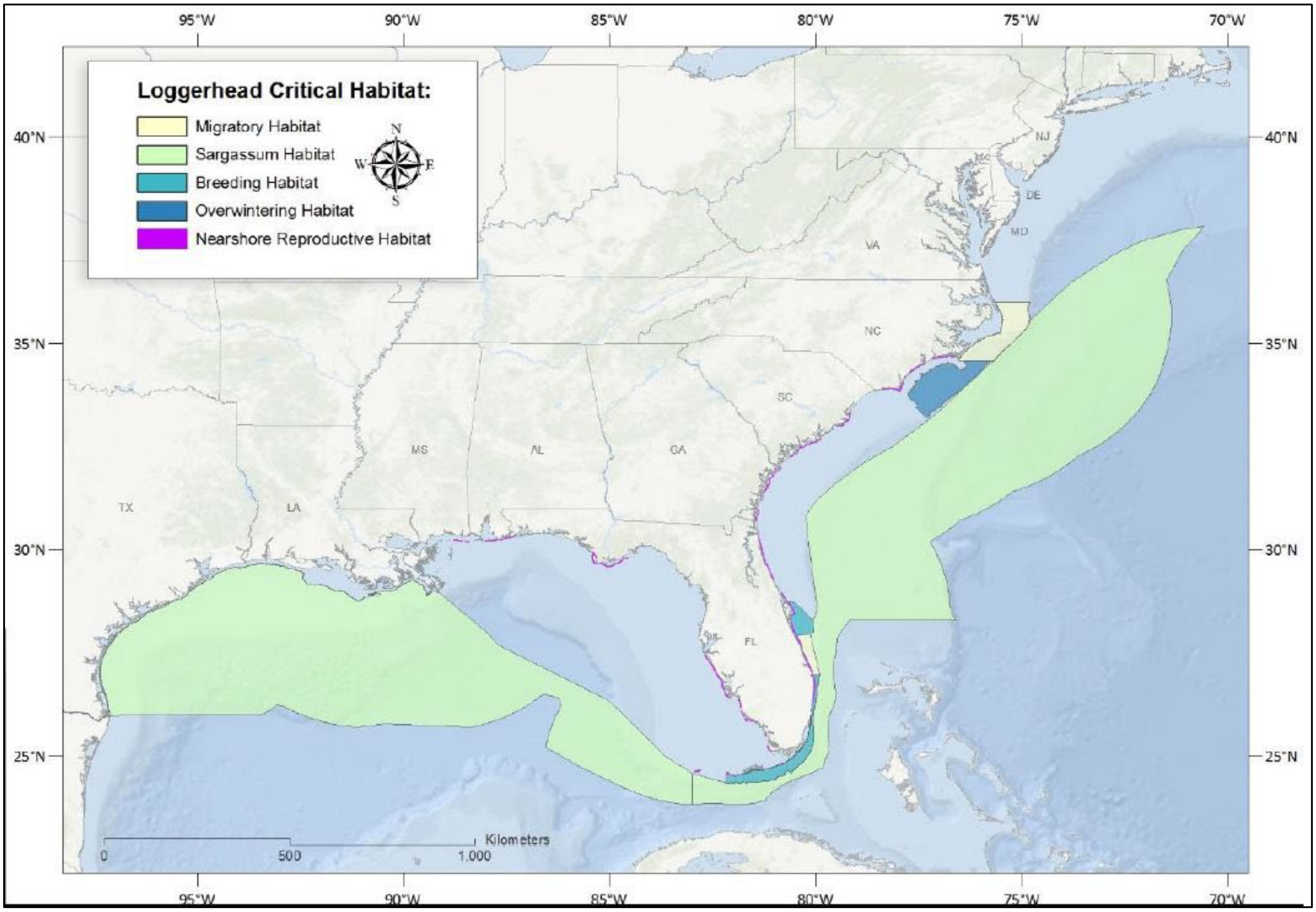

Figure 7. Loggerhead Critical Habitat Southeast Overview Map

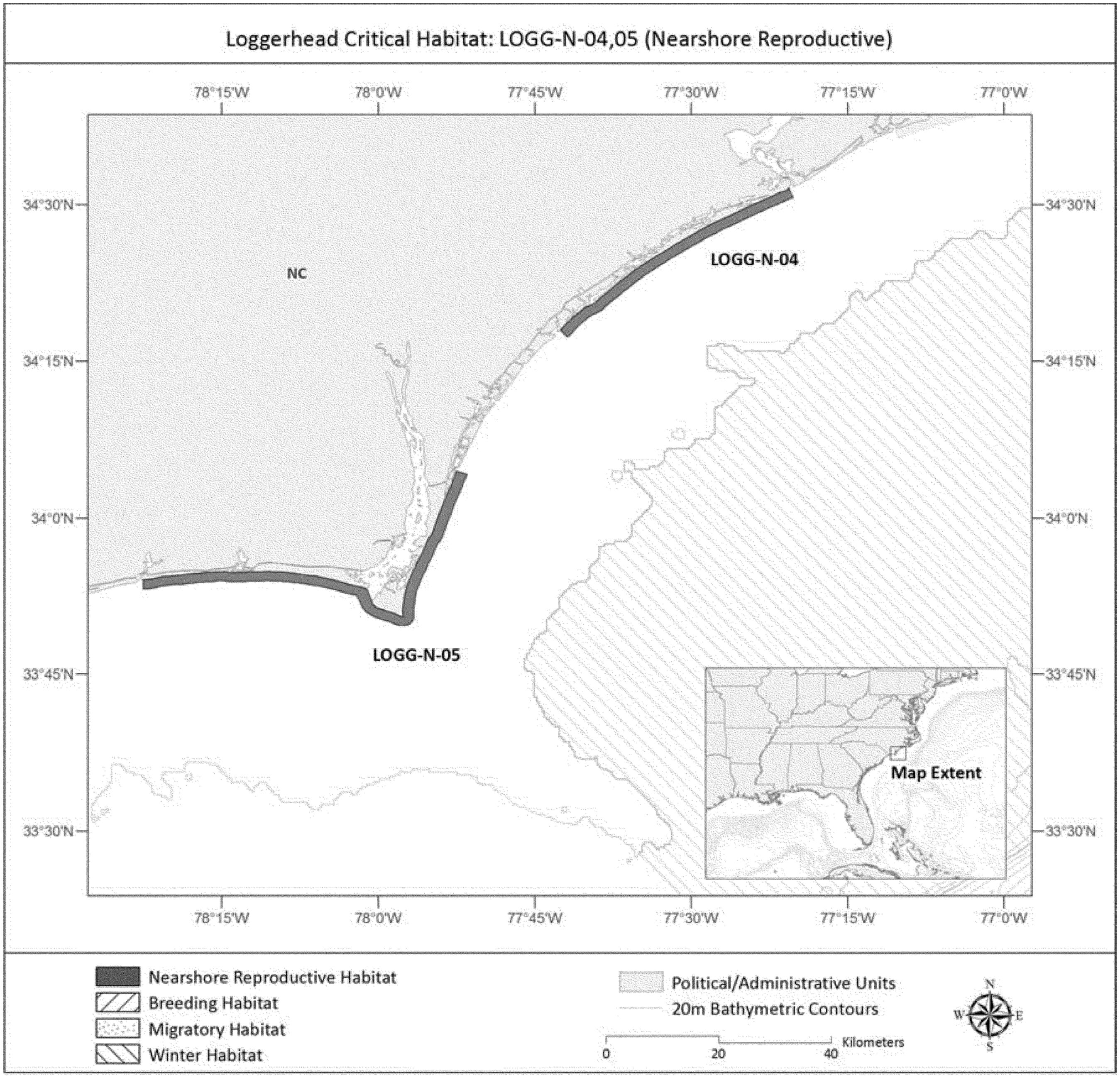

Figure 8. Nearshore Reproductive Habitat for Southeast North Carolina from Final Rule 79 FR 39855, August 11, 2014.

Alternative 1 (No Action) - No Emergency Repair
This alternative would not repair the Wrightsville Beach CSRM project, which would result in continued erosion of sand within the project area, increasing risks to nesting and critical habitat.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
Dredging and beach placement would take an estimated 110 days if completed by one hopper; 55 days if done by 2 hoppers or 50 days if done by a hydraulic cutterhead dredge. Depending on regional incidental sea turtle take numbers at the time of

operations and the risk of project specific take, relocation trawling may be required as a component of offshore borrow hopper dredging operations.

All proper measures and protocols in the USFWS Biological Opinion (Appendix E) and the SARBO would be followed to reduce the risks to sea turtles. Measures include implementing onshore turtle monitors and turtle nest relocation. The risk of physical injury or take of sea turtles by hydraulic cutterhead dredging is an extremely unlikely event that it is not expected to occur. Hydraulic dredging techniques may indirectly impact turtles through (1) short-term impacts to benthic foraging and refuge habitat, (2) short-term impacts to water and sediment quality from re-suspension of sediment and subsequent increase in turbidity/siltation, and (3) disruption of nesting pathways. Change in beach characteristics often results in short-term impacts to nests, the placement of material's effect determination for the USFWS is may affect, likely to adversely affect loggerhead, leatherback, green, hawksbill, and Kemp's ridley sea turtles. Hopper dredges pose a risk to benthic oriented sea turtles through physical injury or death and relocation trawling my entrain sea turtles, therefore the effect determination as identified in the 2020 SARBO is may affect, likely to adversely affect loggerhead, leatherback, green, and Kemp's ridley sea turtles both in the water and on the beach. The proposed action may effect not likely to adversely affect hawksbills in the water and may effect, likely to adversely affect on the beach.

<u>Loggerhead Critical Habitat –</u> The proposed project will have no effect on critical habitat for the threatened loggerhead sea turtle.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area

Due to depth restrictions for hopper dredges, it is likely a hydraulic cutterhead dredge would be used in the inlet. The risk of physical injury or take of sea turtles by hydraulic cutterhead dredging is an extremely unlikely event that it is not expected to occur. As compared to the proposed action, this alternative would remove any impacts to sea turtles from hopper dredging or relocation trawling entrainment. This alternative would also further reduce the duration risk due to fewer total dredging days (45) as compared to the proposed action (likely 110).

3.9.4 Sturgeon

<u>*Shortnose Sturgeon (Acipenser brevirostrum)*</u> - Populations of shortnose sturgeon range along the Atlantic seaboard from the Saint John River in New Brunswick, Canada to the Saint Johns River, Florida. It is apparent from historical accounts that this species may have once been fairly abundant throughout North Carolina's waters; however, many of these early records are unreliable due to confusion between this species and the Atlantic sturgeon (*Acipenser oxyrhynchus*). The shortnose sturgeon is principally a riverine species and is known to use three distinct portions of river systems: (1) non-tidal freshwater areas for spawning and occasional over wintering; (2) tidal areas in the vicinity of the fresh/saltwater mixing zone, year-round as juveniles and during the summer months as adults; and (3) high salinity estuarine areas (15 parts per thousand (ppt.) salinity or greater) as adults during the winter.

Atlantic Sturgeon Carolina DPS (*Acipenser oxyrhynchus*) - The general life history pattern of Atlantic sturgeon is that of a long lived, late maturing, estuarine dependent, anadromous species. The species' historic range included major estuarine and riverine systems that spanned from Hamilton Inlet on the coast of Labrador to the Saint Johns River in Florida. Atlantic sturgeon spawn in freshwater but spend most of their adult life in the marine environment. Spawning adults generally migrate upriver in the spring/early summer; February-March in southern systems, April-May in mid-Atlantic systems, and May-July in Canadian systems.

Comprehensive information on current or historic abundance of Atlantic sturgeon is lacking for most river systems; however, use of the Cape Fear River, NC for spawning and nursery habitat is well documented. Atlantic sturgeon spawning is believed to occur in flowing water between the salt front and fall line of large rivers, where optimal flows are 46-76 cm/s and deep depths of 11-27 meters. Sturgeon eggs are highly adhesive and are deposited on the bottom substrate, usually on hard surfaces. Juveniles spend several years in the freshwater or tidal portions of rivers prior to migrating to sea. Upon reaching a size of approximately 76-92 cm, the subadults may move to coastal waters, where populations may undertake long range migrations.

Effective September 18, 2017, the NMFS designated critical habitat for the distinct population segment of Atlantic sturgeon (Figure 9). Specific occupied areas designated as critical habitat for the Carolina distinct population segment of Atlantic sturgeon contain approximately 1,939 km (1,205 miles) of aquatic habitat in the following rivers of North Carolina and South Carolina: Roanoke, Tar-Pamlico, Neuse, Cape Fear, Northeast Cape Fear, Waccamaw, Pee Dee, Black, Santee, North Santee, South Santee, and Cooper, and the following other water body: Bull Creek. Unit C4 (Cape Fear River, NC/Northeast Cape Fear River, NC) is the closest critical habitat river to the proposed project.

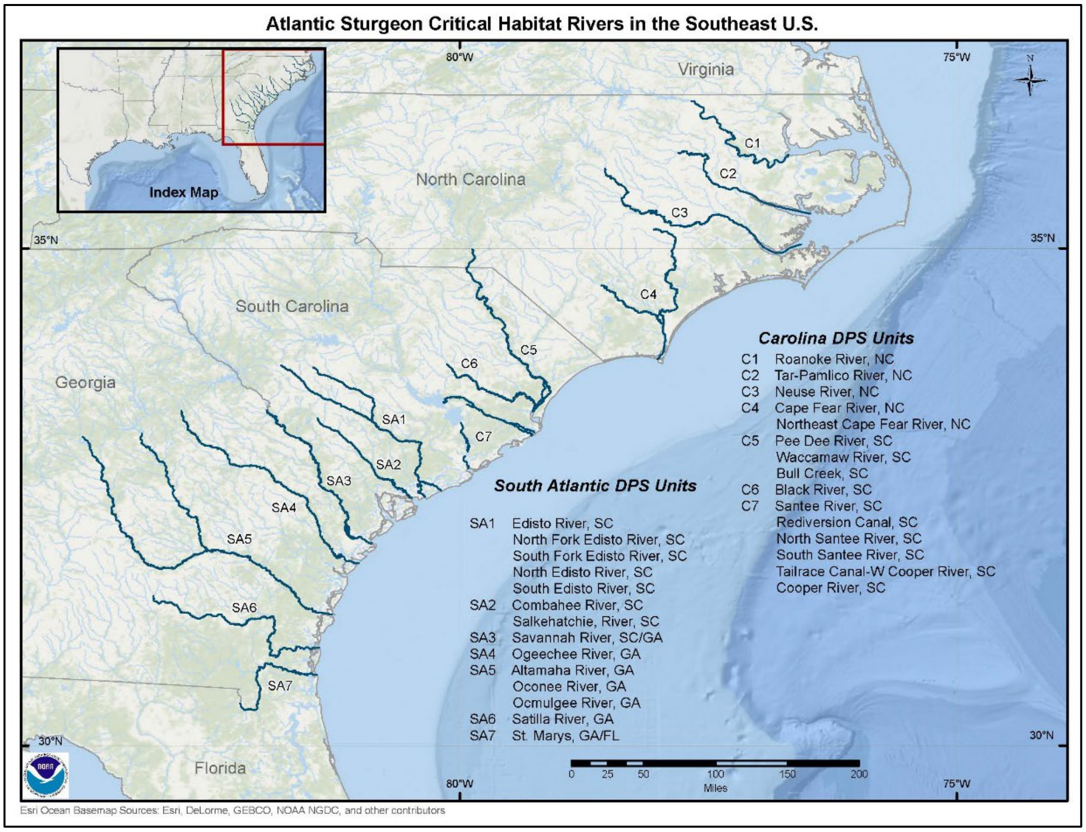

Figure 9. Atlantic Sturgeon Critical Habitat

Alternative 1 (No Action) - No Emergency Repair
This alternative would have no effect on sturgeon or their critical habitat because the project is not located within the geographic range of Atlantic sturgeon critical habitat.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
No site-specific data pertaining to sturgeon distribution within the offshore borrow sources are available. Based on their documented migratory pathways using existing tagging data, it is likely that sturgeon may be migrating through or spending time in or near the offshore borrow areas.

The risk of physical injury or take of sturgeon by hydraulic cutterhead dredging is an extremely unlikely event that it is not expected to occur. Hydraulic dredging techniques may indirectly impact sturgeon through (1) short-term impacts to benthic foraging and refuge habitat, (2) short-term impacts to water and sediment quality from re-suspension of sediment and subsequent increase in turbidity/siltation, and (3) disruption of spawning migratory pathways.

Hopper dredges and relocation trawling do pose risks to sturgeon through physical injury or death by entrainment. All proper measures and protocols in the SARBO will be followed to reduce the risk to sturgeon. Endangered species observers on board hopper dredges will be responsible for monitoring for incidental take of sturgeon. For hopper dredging operations, dragheads as well as all inflow and overflow screening will be inspected for sturgeon species following the same PSO protocol for sea turtles. Therefore, the effect determination as identified in the 2020 SARBO is, may affect, likely to adversely affect the Atlantic and shortnose sturgeon. Beach placement activities would have no effect on sturgeon.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
Due to depth restrictions for hopper dredges, it is likely a hydraulic cutterhead dredge would be used in the inlet. The risk of physical injury or take of sea turtles by hydraulic cutterhead dredging is an extremely unlikely event that it is not expected to occur. As compared to the proposed action, this alternative would remove any impacts to sturgeon from hopper dredging or relocation trawling entrainment. This alternative would also further reduce the risk due to fewer total dredging days (45) as compared to the proposed action (likely 110 or 55 depending on the number of hopper dredges utilized).

3.9.5 Seabeach Amaranth
Seabeach amaranth (*Amaranthus pumilus*) is an annual or sometimes perennial plant that usually grows between the seaward toe of the dune and the limit of the wave uprush zone occupying elevations ranging from 0.2 to 1.5 m above mean high tide. Greatest concentrations of seabeach amaranth occur near inlet areas of barrier islands, but in favorable years many plants may occur away from inlet areas. Seabeach amaranth is considered a pioneer species of accreting shorelines, stable foredune areas, and overwash fans. Seed dispersal of seabeach amaranth is achieved in a number of ways, including water and wind dispersal.

Historically, seabeach amaranth was found from Massachusetts to South Carolina, but according to recent surveys, its distribution is now restricted to North and South Carolina with several populations on Long Island, New York. The decline of this species is caused mainly by development of its habitat, such as inlet areas and barrier islands, and increased off-road vehicle and human traffic, which tramples individual plants.

The USACE has performed seabeach amaranth surveys along all of Wrightsville Beach, NC since 1992. Based on the available data, a total of 4,390 plants have been recorded along Wrightsville Beach since 1992; however, the number of plants significantly declined after 2005 and no plants have been observed on Wrightsville Beach since 2016, when only 1 plant was observed (Table 9). Other beaches along the North Carolina coast have experienced similar declines in seabeach amaranth. Shoreline erosion and accretion processes associated with natural storm events and beach dynamics likely play an important role in explaining the random spatial and temporal abundance patterns.

Since seabeach amaranth seeds are fairly resilient and germination is dependent on critical physical conditions, populations of seabeach amaranth are very dynamic, with numbers of plants fluctuating dramatically from year to year. Germination begins in April as temperatures reach about 25ºC (77ºF) and continues at least through July with greatest germination occurring at 35ºC (95ºF). Seed production begins in July or August, peaks in September, and continues until the plant dies. Seabeach amaranth is physically controlled (saltwater inundation, temperature, emergence at depth, etc.) rather than biologically controlled (web worm). Furthermore, seedlings are unable to emerge from depths greater than 1cm; however, seabeach amaranth seeds are resilient, and century–old seeds of some species of amaranth are capable of successful germination and growth.

Table 9. Total Amaranthus Count by Year on Wrightsville Beach

Year	Total	Year	Total
1992	416	2009	0
1993	157	2010	0
1994	38	2011	2
1995	1,323	2012	0
1996	289	2013	0
1997	22	2014	0
1998	191	2015	0
1999	1	2016	1
2000	5	2017	0
2001	64	2018	0
2002	104	2019	0
2003	735	2020	0
2004	782	2021	0
2005	244	2022	0
2006	4		
2007	9		
2008	3		
		Total	4,390

Alternative 1 (No Action) - No Emergency Repair
This alternative would not repair the Wrightsville Beach CSRM project, which would result in continued erosion of sand within the project area, reducing habitat for seabeach amaranth.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
If seabeach amaranth seeds are still present on Wrightsville Beach, the emergency repair and the resulting deep burial of seeds on a portion of the beaches may slow germination and population recovery over the short-term; therefore, the project may affect, likely to adversely affect seabeach amaranth. However, the beach repair will increase the beach width, providing additional habitat for seabeach amaranth.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
Impacts of this alternative would be the same as the proposed action.

3.9.6 Piping Plover

The Atlantic Coast piping plover (*Charadrius melodus*) population breeds on coastal beaches from Newfoundland to North Carolina (and occasionally in South Carolina) and winters along the Atlantic Coast (from North Carolina south), the Gulf Coast, and in the Caribbean where they spend a majority of their time foraging. Since being listed as threatened in 1986, only 800 pairs were known to exist in the three major populations combined and by 1995 the number of detected breeding pairs increased to 1,350. This population increase can most likely be attributed to increased survey efforts and implementation of recovery plans.

The species typically nests in sand depressions on unvegetated portions of the beach above the high tide line on sand flats at the ends of sand spits and barrier islands, gently sloping foredunes, blowout areas behind primary dunes, sparsely vegetated dunes, and washover areas cut into or between dunes. Piping plovers head to their breeding grounds in late March or early April and nesting usually begins in late April; however, nests have been found as late as July. The largest reported nesting concentration of the species in the State appears to be on Portsmouth Island where 19 nests were discovered in 1983. The southernmost nesting record for the state was one nest located in Sunset Beach by in 1983. Feeding areas include intertidal portions of ocean beaches, washover areas, mud flats, sand flats, wrack lines, and shorelines of coastal ponds, lagoons, or salt marshes. Prey consist of worms, fly larvae, beetles, crustaceans, mollusks, and other invertebrates.

The piping plover is a fairly common winter resident along the beaches of North Carolina. On July 10, 2001, the USFWS designated 137 areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas as critical habitat for the wintering population of the piping plover where they spend up to 10 months of each year on the wintering grounds. Constituent elements for the piping plover wintering habitat are those habitat components that are essential for the primary biological needs of foraging, sheltering, and roosting, and only those areas containing these primary constituent elements within the designated boundaries are considered critical habitat. The USFWS has defined textual unit descriptions to designate areas within the critical habitat boundary. These units describe the geography of the area using reference points, include the areas from the landward boundaries to the MLLW, and may describe other areas within the unit that are utilized by the piping plover and contain the primary constituent elements.

Impacts to the piping plover from sand placement projects typically include disturbance and disruption of normal activities such as roosting and foraging. The direct impacts are temporary and are expected to impact a limited number of piping plovers that may be present in the area.

Burial and suffocation of invertebrate species will occur during sand placement and will affect up to 15,650 linear feet of shoreline. It is expected that the prey base of piping plover will recover within two years. These impacts would be considered temporary and are expected to impact a limited number of piping plovers that may be present in the Action Area over future nesting, wintering, and migration seasons (USFWS 2016).

NC-12 and NC-13 are USFWS designated piping plover critical habitat units within the vicinity of the project. NC-12 is located at the northern most tip of Wrightsville Beach and NC-13 includes the northern most tip of Masonboro Island and portions of

Masonboro Inlet (Figure 10). It includes the contiguous shoreline from MLLW to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur along the Atlantic Ocean and either inlet. The limits of critical habitat are constantly evolving based on the presence or absence of constituent elements.

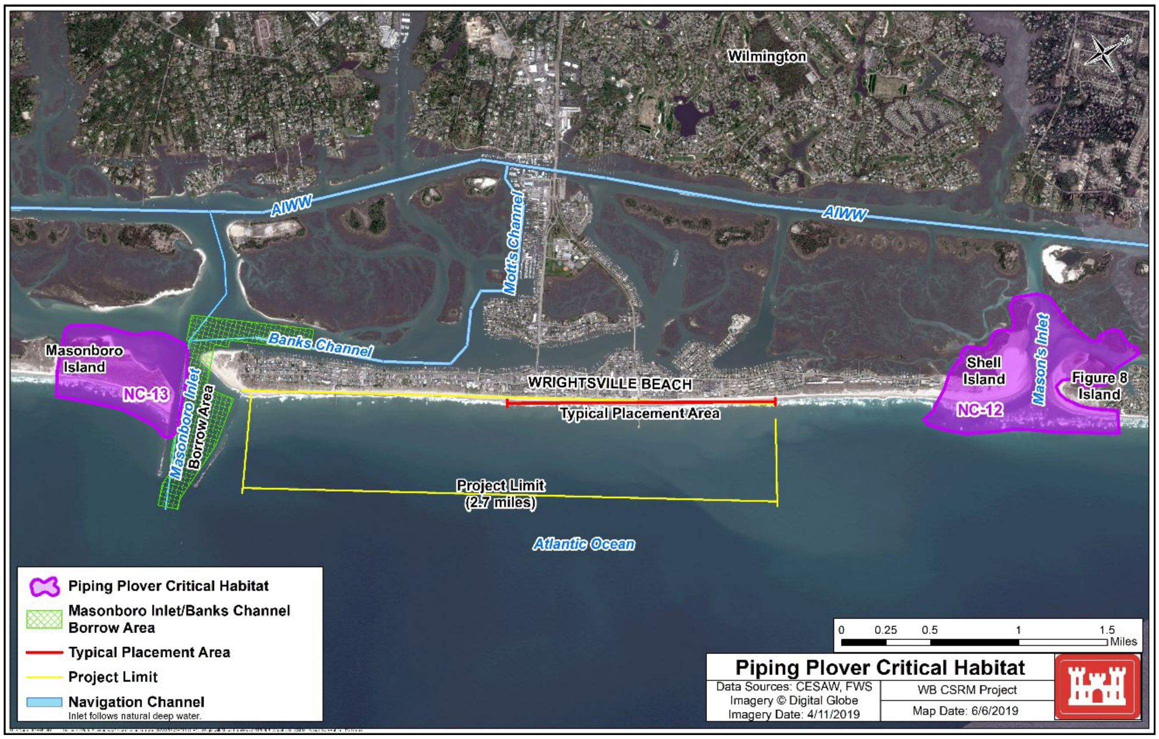

Figure 10. Piping Plover Critical Habitat

Alternative 1 (No Action) - No Emergency Repair
This alternative would not repair Wrightsville Beach which would result in continued erosion of sand within the CSRM project area, increasing risks to foraging, sheltering and roosting habitat.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
The project may result in short-term impacts to foraging, sheltering and roosting habitat along the oceanfront due to disturbance from repair equipment and the burial of prey species. Use of the offshore borrow area would avoid the impacts from a pipeline along the southern end of the island and avoid the loss of spit habitat as mentioned in Section 3.6. Both piping plover critical habitat units, (NC-12 ~1 mile, NC-13 ~0.5 miles), may see increased shoaling due to placed sands drifting to both inlets.

The long-term effects of the project may restore lost roosting and nesting habitat through the addition of beach fill; however, short-term impacts to foraging, sheltering and roosting habitat may occur during the emergency repair. The project may affect, likely to adversely affect the piping plover and may have a long-term positive impact on critical habitat.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
Impacts of this alternative would be similar to the proposed action; however, potential impacts may be caused by repair equipment in the inlet and the pipeline running from the inlet to the northern extent of the project and associated human activities. Use of the inlet borrow area would impact the southern end spit habitat impacts as mentioned in Section 3.6. This alternative would reduce the risk of impacts on the beach due to fewer total dredging days (45) as compared to the proposed action (likely 110). The project may affect, likely to adversely affect the piping plover and would have no effect on critical habitat.

3.9.7 Red Knot

The Red Knot (*Calidris canutus rufa)* is a medium-sized shorebird that undertakes an annual 30,000 km hemispheric migration, one of the longest among shorebirds. Their migration route extends from overwintering sites in the southernmost tip of South America at Tierra del Fuego, up the Eastern coast of the Americas through the Delaware Bay, and ultimately to breeding sites in the central Canadian Arctic. Red Knots break their migration into strategically timed and selected non-stop segments, of approximately 1,500 miles, throughout the entire Atlantic coast, including North Carolina where July-August numbers decline as final populations depart for their winter habitat. These staging areas consist of highly productive foraging locations which are repeatedly used year to year. As the Red Knot moves towards the northern extent of its migration route, the timing of departures becomes increasingly synchronized. One critical foraging stop for Red Knots occurs in the Delaware Bay where they feed almost exclusively on horseshoe crab eggs, due to their high fat content and ease of digestion, in order to reach threshold departure masses (180-200 grams) prior to heading for the Arctic breeding grounds. The arrival of the Red Knot in the Delaware Bay coincides with the spawning of the horseshoe crabs, which peaks in May and June. Birds arrive emaciated and can nearly double their mass (~4.6 grams/day) prior to departure if foraging conditions are favorable, eating an estimated 18,000 fat-rich horseshoe crab eggs per day. This critical foraging stopover enables Red Knots to achieve the nutrient store levels necessary for migration, survival, and maximizing the reproductive potential of the population. In order to increase their body mass at such a rapid rate during their refueling stopover in the Delaware Bay, Red Knots morph their guts during their migration route from South America to Delaware.

Red Knots feed extensively in the intertidal zone and on small coquina clams and horseshoe crab eggs, so they are either seen feeding voraciously or resting. Once they build up adequate fat reserves, they fly to their next stopover site. Some Red Knots have geo-locators on their leg bands and such data demonstrate that they can fly hundreds of miles without stopping if they have adequate fat stores.
The best places for red knots to feed and rest are large intertidal areas for foraging, with foredunes in which to rest. No disturbance at these sites from pedestrians, dogs, or vehicles would be tolerated by the birds; thus, busy sites are not used.

Alternative 1 (No Action) - No Emergency Repair
This alternative would not repair the Wrightsville Beach CSRM project, which would result in continued erosion of sand within the project area, increasing risks to foraging, sheltering and roosting habitat.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
During the emergency repair process, activities may affect red knots through disturbance and behavioral modification. Disturbance may cause migrating and wintering red knots to spend less time foraging and conserving energy; thereby potentially affecting survivability and productivity. Disturbance may prevent red knots from using otherwise suitable foraging, sheltering, and roosting sites; requiring birds to expend additional energy seeking out alternative habitats. The initial effects of sand placement would include the loss of most intertidal benthic invertebrates within the placement areas. Reductions in the availability of invertebrate prey may negatively affect the energy budgets of red knots; potentially resulting in reduced survivability and productivity. All work will be accomplished in accordance with the USFWS Biological Opinion (Appendix E) when issued for this one-time emergency repair.

The long-term effects of the project may restore migrating and wintering habitat through the addition of beach repair activities at Wrightsville Beach; however, short-term impacts to foraging, feeding, sheltering, and roosting habitat may occur during the repair. Any beach repair action that occurs during the month of May would have negative impacts on the quality and/or availability of foraging and roosting habitats. July-August numbers decline as final populations depart for their winter habitat. Considering that beach placement activities may occur during peak red knot migration (May-June), the placement of sand on the beach may affect, likely to adversely affect the species.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
Impacts of this alternative would be similar to the proposed action. Use of the inlet borrow area would impact the southern end spit habitat impacts as mentioned in Section 3.6. Additional impacts may be caused by the pipeline running from the inlet to the northern extent of the project and associated human activities; however, the duration of impacts would be less than the proposed action (45 days as compared to 110 or 55 days for the proposed action).

3.9.8 Giant Manta Ray
The giant manta ray is the largest living ray, with a wingspan reaching a width of up to 23 feet, and an average size between 15-16.5 feet. The giant manta ray is recognized by its large diamond-shaped body with elongated wing-like pectoral fins, ventrally placed gill slits, laterally placed eyes, and wide terminal mouth. The giant manta ray can be found in all ocean basins. In terms of range, within the Northern hemisphere, the species has been documented as far north as southern California and New Jersey on the United States west and east coasts, respectively.

Giant manta rays make seasonal long-distance migrations, aggregate in certain areas and remain resident, or aggregate seasonally. They have also been observed in estuarine waters near oceanic inlets, with use of these waters as potential nursery grounds. Giant manta rays primarily feed on planktonic organisms such as euphausiids, copepods, mysids, decapod larvae and shrimp, but some studies have noted their consumption of small and moderately sized fishes (Miller and Klimovich 2017). There are no current or historical estimates of global abundance of giant manta rays, with most estimates of subpopulations based on anecdotal observations.

In the U.S. Atlantic, the giant manta rays appear to have a seasonal pattern of occurrence along the east coast of Florida, showing up with greater frequencies (and in greater numbers) in the spring and summer months (84 FR 66652; Publication Date December 5, 2019). Available sightings data indicates the seasonal visitation of manta rays to Florida's inshore waters, possible juvenile habitat, and possible residency. The numbers, location, and peak timing of the manta rays to this area varies by year (H. Webb unpublished data). In 2015, aerial survey conducted by the Georgia Aquarium peaked at 1,144 manta ray sighted in the inshore waters of northeast Florida, but with notable decline in manta rays observed in the study area since 2015 (H. Webb unpublished data). In addition, juvenile giant manta rays have also been regularly observed inshore off the southeast Florida.

Vessel strikes can injure or kill giant manta rays, decreasing fitness or contributing to non-natural mortality (Couturier et al. 2012; Deakos et al. 2011). Giant manta rays can be frequently observed traveling just below the surface and will often approach or show little fear toward humans or vessels (Coles 1916a), which can also make them extremely vulnerable to vessel strikes (Deakos 2010). Five giant manta rays were reported to have been struck by vessels from 2016 through 2018; individuals had injuries (i.e., fresh or healed dorsal surface propeller scars) consistent with a vessel strike. These interactions were observed by researchers conducting surveys from Boynton Beach to Jupiter, Florida (J. Pate, Florida Manta Project, unpublished data). The giant manta ray is frequently observed in nearshore coastal waters and feeding at inlets along the east coast of Florida. As vessel traffic is concentrated in and around inlets and nearshore waters, this overlap exposes the giant manta ray in these locations to an increased likelihood of potential vessel strike injury. Yet, few instances of confirmed or suspected mortalities of giant manta ray attributed to vessel strike injury (e.g., via strandings) have been documented. This lack of documented mortalities could also be the result of other factors that influence carcass detection (i.e., wind, currents, scavenging, decomposition etc.).

Alternative 1 (No Action) - No Emergency Repair
This alternative would have no effect on giant manta rays.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
There is not a risk of entrainment and impingement from hopper dredging and vessel strike with a giant manta ray is extremely unlikely, and therefore discountable.

Relocation trawling may effect, likely to adversely affect the giant manta ray. All recommendations as mentioned in the 2020 SARBO (**https://www.fisheries.noaa.gov/content/endangered-species-act-section-7-biological-opinions-southeast)** would be followed in order to reduce the impacts and risks.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
Hydraulic cutterhead dredging does not pose a risk of entrainment to the giant manta ray and vessel strike is extremely unlikely, and therefore discountable. No relocation trawling would be required for this alternative. Therefore, Alternative 3 will have no effect to the giant manta.

3.9.9 Smalltooth Sawfish U.S. DPS
Smalltooth sawfish U.S. DPS inhabit shallow coastal waters of the Atlantic Ocean (Dulvy et al. 2016) and feed on a variety of fish (e.g., mullet, jacks, and ladyfish) (Poulakis et al. 2017; Simpfendorfer 2001). Within the United States, smalltooth sawfish have historically been captured in estuarine and coastal waters from North Carolina southward through Texas, although peninsular Florida has been the region of the United States with the largest number of recorded captures (NMFS 2018e). Water temperatures (no lower than 8-12°C) and the availability of appropriate coastal habitat (shallow, euryhaline waters and red mangroves) are the major environmental constraints limiting the northern movements of smalltooth sawfish in the western North Atlantic. Most specimens captured along the Atlantic coast north of Florida are large juveniles or adults (over 10 feet) that likely represent seasonal migrants, wanderers, or colonizers from a historical Florida core population to the south, rather than being members of a continuous, even-density population (Bigelow and Schroeder 1953). While adult smalltooth sawfish may also use the estuarine habitats used by juveniles, they are commonly observed in deeper waters along the coasts.

Few long-term abundance data exist for the smalltooth sawfish, making it very difficult to estimate the current population size. Past literature indicates smalltooth sawfish were once abundant along both coasts of Florida and quite common along the shores of Texas and the northern Gulf coast (NMFS 2010). Based on recent comparisons with these historical reports, the U.S. DPS of smalltooth sawfish has declined over the past century (Simpfendorfer 2001; Simpfendorfer 2002). The decline in smalltooth sawfish abundance has been attributed to several factors including bycatch mortality in fisheries, habitat loss, and life history limitations of the species (NMFS 2010).

Alternative 1 (No Action) - No Emergency Repair
This alternative would have no effect on smalltooth sawfish.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
There is not a risk of entrainment and impingement from hopper dredging and vessel strike with a smalltooth sawfish is extremely unlikely, and therefore discountable. Relocation trawling may effect, likely to adversely affect the smalltooth sawfish. All recommendations as mentioned in the 2020 SARBO

(**https://www.fisheries.noaa.gov/content/endangered-species-act-section-7-biological-opinions-southeast)** would be followed in order to reduce the impacts and risks.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
Hydraulic cutterhead dredging does not pose a risk of entrainment to the smalltooth sawfish and vessel strike is extremely unlikely, and therefore discountable. No relocation trawling would be required for this alternative. Therefore, Alternative 3 will have no effect to smalltooth sawfish.

3.10 Cultural Resources

From the mid-seventeenth century to the mid-eighteenth century the Cape Fear region of North Carolina remained relatively unsettled. Numerous factors contributed to the lack of settlers into the area including the geography of the region, the hostile Cape Fear Indians, pirates who used the area as a base of operations, and the subsequent closing of the Carolina land offices by the proprietors (Hartzer, 1983).

However, by the mid-eighteenth century a number of factors helped to clear the way for settlement of the Cape Fear Region. Piracy had been prevalent in the area but after 1718 both Edward Teach (Blackbeard) and Stede Bonnet were captured and killed off North Carolina; thus, piracy in the region was reduced to a great degree. The fear of hostile Indians in the region was also reduced when colonists defeated the Cape Fear and Tuscarora Indians after a series of bloody battles which ended around 1720 (Hartzer, 1983).

In 1725 Colonel Maurice Moore founded the town of Brunswick, 12 miles above the mouth of the Cape Fear River. Moore had fought in the area during the Indian wars and was determined to return and settle the area. In response to Moore's attempt to settle the region, proprietary governor George Burrington reopened the land office in 1725. By 1733 a new town was established 16 miles upriver from Brunswick called New Carthage (1733), New Liverpool, New Town (or Newton), then Wilmington (1740). Both quickly became commercial and political rivals, each vying to control southeastern North Carolina (Hartzer, 1983). In 1740 the town of Wilmington had replaced Brunswick as the county seat of New Hanover.

Both Brunswick and Wilmington became central outposts for the distribution of Naval stores such as turpentine, rosin, tar, and pitch. These Naval stores were the leading export of North Carolina and remained so through 1870. While Brunswick catered to larger ships because of its location, Wilmington became an important port for smaller vessels involved with the coastal and West Indian markets. Wilmington became the premier port as Brunswick was abandoned by the British in 1776 (Watts et al. 1978).

Although Masonboro Inlet was in close proximity to Wilmington, it played only a minor role in the commercial activity of the area. Documentation of commerce within the Cape Fear region during the eighteenth and nineteenth centuries shows that Masonboro Inlet was used mainly by local fisherman with shallow draft vessels (Watts et al., 1978).

During the United States' Civil War, Wilmington became the Confederacy's most essential port for the importation of war materials. The Union blockade used Masonboro Inlet as a base for attacks against Confederate salt works in the area and to destroy an unfinished Confederate fortification on the south side of the inlet (Watts et al., 1978:8). From 1865 to 1920, Wilmington remained an important port for the exportation of products such as turpentine, cotton, and guano. Concurrently, Wrightsville Beach (north of Masonboro Inlet) grew as a popular tourist resort. Although growth in the area increased, Masonboro Inlet continued to be used primarily by smaller fishing vessels. Larger vessels were discouraged by the inlet's continually shifting channel and shallow waters (Watts et al., 1978). Table 10 represents a list of vessels documented to have wrecked in the Wrightsville Beach vicinity.

Table 10. Vessels Documented to Have Wrecked in the Wrightsville Beach Vicinity.

Date	Vessel Name	Vessel Type	Description
June 1, 1842	Ashley	brig	Total loss, 1 mile north of Deep Inlet
January 12, 1856	Sam Berry	steamer	Wrecked on reef 3 miles south of Masonboro Inlet
July 6, 1862	Unknown	schooner	Discovered burning on shore at Masonboro inlet
August 1, 1862	Lizzie of Nassau	sloop	Captured and destroyed 12 to 15 miles above Fort Fisher, 4 miles out to sea
November 4, 1862	Sophie	bark	Forced aground and destroyed south of Masonboro Inlet
November 5, 1862	Unknown	schooner	Destroyed south of inlet
November 17, 1862	J.W. Pindar	schooner	Forced aground and destroyed south of Masonboro Inlet
January 14, 1863	Columbia	Federal gunboat	Grounded and lost ashore south of Masonboro Inlet
February 10, 1864	Emily of London	steamer	Sighted aground north of Masonboro Inlet and destroyed by Union forces
February 10, 1864	Fanny and Jenny	steamer	Forced aground and destroyed north of Masonboro Inlet
November 15, 1864	Unknown	schooner	Wrecked south of Masonboro Inlet
1860's	Unknown	wooden	May be vessel burned during the Civil War
May 6, 1873	Toy	schooner	Ran ashore just inside Masonboro Inlet

Date	Vessel Name	Vessel Type	Description
October 1887	Naomi	schooner	Middle of Wrightsville Beach
March 24, 1888	Frances	schooner	Ran ashore on Wrightsville Beach, total loss
February 1893	Oklahoma	steam launch	Struck the bar while attempting to enter Moore's Inlet, during heavy seas
Fall, 1894	Najaiden	Norwegian barque	Wrecked on Wrightsville Beach
1896	Unknown		Near Masonboro Inlet
February 1906	Katie	schooner	Unknown
October 29, 1929	Unknown	yacht	Grounded on Masonboro beach while attempting to go through the inlet
August 1932	Summer Girl	cabin cruiser	Struck the wreck of a sunken blockade runner just north of the mouth of Masonboro Inlet
1943	Unknown	50-foot vessel	Unconfirmed loss of a U.S. Coast Guard vessel
Late 1940's, early 1950's	Unknown	two wooden-hulled boats	Captain Linwood Roberts, charter boat captain, stated that two vessels sunk in Masonboro Inlet
1951	Unknown	30-32 feet shrimp boat	Vessel struck the wreck of a Civil War blockade runner just north of the mouth of Masonboro Inlet
1970's	Unknown	small pleasure craft	Inboard pleasure vessel ran aground south of Masonboro Inlet

Sources: Watts et al. 1978 and Watts 1995

In 1977 the USACE Wilmington District completed a magnetometer survey of Masonboro Inlet/Banks Channel. This survey was undertaken to locate any submerged cultural resources that might have been impacted by modifications to the existing inlet. These modifications, that were to be implemented during the summer of 1978, included the construction of a 3,450-foot jetty along the south side of the existing inlet and the dredging of a channel 400 feet wide and 14 feet deep (in Masonboro Inlet). A total of five magnetic anomalies in the survey area were noted (Saltus, 1978).

Additional investigations of the Masonboro Inlet and Island anomalies were conducted by the Underwater Archaeology Unit of the North Carolina Division of Archives and History in 1977 (Watts et al. 1978). The survey relocated the potentially significant magnetic targets originally located in the 1977 magnetometer survey. Anomaly 1 was the remains of a sidewheel steamer located north of the existing jetty at Masonboro Inlet. Anomaly 2 was located near the seaward end of the existing north jetty. Anomaly 3 was located south of the navigation channel within Masonboro Inlet, and anomaly 4 was located near the northern tip of the inlet (Watts et al. 1978).

The Underwater Archaeology Unit of the North Carolina Office of State Archaeology (formerly the North Carolina Division of Archives and History) conducted a magnetometer survey of known magnetic anomalies between the north jetty of Masonboro Inlet and Johnny Mercer's Pier in 1984. A total of six targets were investigated during the survey. One target, near the end of the north jetty, was identified as a series of iron I-beams extending out of the sand. It is speculated that these I-beams either served as cribbing supports or as a structural component from the vessel Columbia (Watts 1995).

Previously identified cultural resources requiring avoidance buffers are present within Masonboro Inlet. As described in the February 1999 Panamerican Consultants, Inc. report 'Underwater Archaeological Site Identification at Masonboro Inlet, Wrightsville Beach, New Hanover County, North Carolina', a Navy gunboat known as the USS Columbia sunk near the inlet in 1864 and is believed to rest in the mouth of the inlet approximately 500 feet southwest of the northern terminal groin at Wrightsville Beach. Dredging events in the past decade (2010 and 2018) have unintentionally excavated multiple ordinance-related artifacts, further increasing the probability that the USS Columbia rests beneath the seafloor in the mouth of the inlet. In all instances of inadvertent artifact excavation, the USACE promptly informed NC State Historic Preservation Office (SHPO) and/or the NC Department of State Archaeology.

Regarding the currently proposed sand placement activities on and offshore of Wrightsville Beach, the U.S. Army Corps of Engineers, Wilmington District (USACE) contracted with Geodynamics, LLC in 2021 to perform thorough hydrographic and magnetometer surveys within the selected sand borrow site (Figure 3). To identify any potentially significant submerged cultural resources within the site, Geodynamics contracted with Tidewater Atlantic Research (TAR) of Washington, North Carolina to analyze and interpret the surveys' magnetic and acoustic remote-sensing data and to generate a report document summarizing findings.

The side scan sonar data conducted by Geodynamics identified thousands of tires in the area surveyed and TAR identified approximately 1,700 magnetic anomalies that likely originated from artificial reef AR-370 (Section 2.1 and Appendix C). Virtually all magnetic anomalies were characterized by low-intensity short-duration signatures that have no association with potentially significant submerged cultural resources.

Concentrations of tires and magnetic anomalies previously associated with the artificial reef AR-370 render much of the borrow site unusable; however, the USACE has identified suitable sediment areas of the borrow site that will minimize encounters with debris and provide adequate material volume with which to complete the emergency repair. The USACE intends to use portions of the borrow site that present no tires on the surface and minimal subsurface magnetic anomalies.

In accordance with Section 106 of the National Historic Preservation Act (NHPA), this EA has been coordinated with the North Carolina State Historic Preservation Office/Officer to ensure that effects of the proposed action (Alternative 2 below) will not adversely affect submerged cultural resources. The borrow areas included in the proposed action (Alternative 2) have been surveyed to identify the presence of submerged archaeological resources. Survey results are currently being shared and coordinated with the SHPO so that effects to submerged cultural resources associated with the proposed action are avoided. A record of recent correspondence with SHPO pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800 is included in Appendix F. This project is compliant with Protection and Enhancement of the Cultural Environment E.O. 11593.

Alternative 1 (No Action) - No Emergency Repair
This alternative would have no effect on cultural resources.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
Repair activities have the potential to encounter buried shipwrecks although none were identified during the cultural survey. In order to achieve full compliance with Section 106 of the National Historic Preservation Act of 1966 and the Abandoned Shipwreck Act of 1987, magnetometer surveys were conducted in borrow areas under consideration. Results of these surveys were coordinated with the North Carolina Office of State Archaeology (OSA) and North Carolina State Historic Preservation Office (SHPO) to ensure that all identified shipwrecks and archaeological sites eligible or potentially eligible for listing on the National Register of Historic Places would not be affected by the proposed action; although data suggest that none of the magnetic anomalies detected in the proposed borrow area are associated with submerged cultural resources (Appendix C). All locations identified as acceptable alternatives for beach access for pipeline, pipe staging areas, location of pipeline routes, and offshore anchoring will be surveyed by the dredging company contracted to complete the project and coordinated with the OSA/SHPO prior to implementation of the proposed action. Contractors shall be made aware that in the event unknown resources are encountered, work in that area shall cease until assessment and consultation between the USACE and OSA/SHPO been completed. No effect to historic properties, historic shipwrecks, or any other cultural resources requiring consideration under the National Historic Preservation Act or Abandoned Shipwreck Act is anticipated under the proposed action.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
Renourishment activities have the potential to encounter buried shipwrecks, but all known sites near the inlet borrow source have been documented and will be avoided. Contractors will be made aware that in the event unknown resources are encountered, work in that area shall cease until assessment and consultation between the USACE and OSA/SHPO has been completed. This alternative greatly reduces the risk of encountering tires or other significant debris as none are known in the Masonboro

Inlet/Banks Channel borrow area. No effect to historic properties, historic shipwrecks, or any other cultural resources requiring consideration under the National Historic Preservation Act or Abandoned Shipwreck Act is anticipated under the Proposed Plan.

3.11 Climate Change

The global average temperature has increased by more than 1.5°F since the late 1800s. Many factors, both natural and human, can cause changes in Earth's energy balance, including:

- Variations in the sun's energy reaching Earth
  Changes in the reflectivity of Earth's atmosphere and surface
- Changes in the greenhouse effect, which affects the amount of heat retained by Earth's atmosphere
- Greenhouse gases come from a variety of human activities, including: burning fossil fuels for heat and energy, clearing forests, fertilizing crops, storing waste in landfills, raising livestock, and producing some kinds of industrial products (**www.epa.gov**). Greenhouse gasses are discussed in more detail in Section 7.2.1.

A review of the U.S. Environmental Protection Agency's analysis for climate change for North Carolina titled *What Climate Change Means for North Carolina* (**https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-nc.pdf**) states:

- Most of North Carolina has warmed 0.5-1.0 degrees Fahrenheit in the last 100 years. The southeastern United States has warmed less than most of the nation.
- Tropical storms and hurricanes have become more intense during the past 20 years. Hurricane wind speeds and rainfall rates are likely to increase as the climate continues to warm.
- Increased rainfall may further exacerbate flooding in some coastal areas. Since 1958, the amount of precipitation during heavy rainstorms has increased by 27 percent in the Southeast, and the trend toward increasingly heavy rainstorms is likely to continue.

This project will not increase the effects of climate change in the project area; however, the project area is likely to be affected by climate change due to the proximity of the project to the coast where effects of climate change, such as increased storm events and sea level rise, will likely be more dramatic than inland portions of the State. Increased frequency and intensity of storm events will likely increase erosion rates which may increase the need for larger, or more frequent, renourishments to maintain coastal storm risk management benefits.

Alternative 1 (No Action) - No Emergency Repair

The No Action alternative would not repair the current damage and therefore would result in increased erosion and increases risks of coastal storm damages along the project area.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
The proposed action would conduct a one-time repair which would reduce erosion and the risk of coastal storm damages, providing protection from the increased frequency and intensity of storm events.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
This alternative would have the same impacts as the proposed action.

3.12 Sea Level Change

Relative sea level refers to the local elevation of the sea with respect to land, including the lowering or rising of land through geologic processes, such as subsidence and glacial rebound. It is anticipated that sea level will rise within the next 100 years. To incorporate the direct and indirect physical effects of projected future sea-level change on design, renourishment, operation, and maintenance of coastal projects, the USACE has provided guidance in EC 1165-2-212 that has been superseded by ER 1100-2-8162 and Engineer Technical Letter 1100-2-1.

In accordance with ER 1100-2-8162, dated December 31, 2013, potential relative sea level change must be considered in every USACE coastal activity as far inland as the extent of estimated tidal influence. Based on historical sea level measurements taken from NOS gage 8658120 at Wilmington, North Carolina, the historic sea level change rate was determined using the *updated published* seal level change fetched from *http://www.corpsclimate.us/ccaceslcurves.cfm*. The economic analysis period for this study begins with a Beach-fx model start date of 2021 (economic base year of 2022) and extends to the end of the project life in FY 2036. At Gauge 8658120, the mean sea level trend is 2.07 mm/year (0.00679 feet/year) with a 95 percent confidence interval of +/- 0.35 mm/year (0.00114 feet/year) based on monthly mean sea level data over a 72-year record (Figure 11) which is equivalent to a change of 0.11 feet over the remaining life of the project (FY 2036). The Intermediate rate was determined to be 3.97 mm/year (0.0130 feet/year). The High rate was determined to be 9.98mm/year (0.0327 feet/year). This results in an Intermediate and High change in sea level between the start year (FY 2021) and the end of the project life (FY 2036) of 0.21 feet and 0.55 feet, respectively. Relative sea level change between 2021 and 2036 is shown graphically in Figure 12.

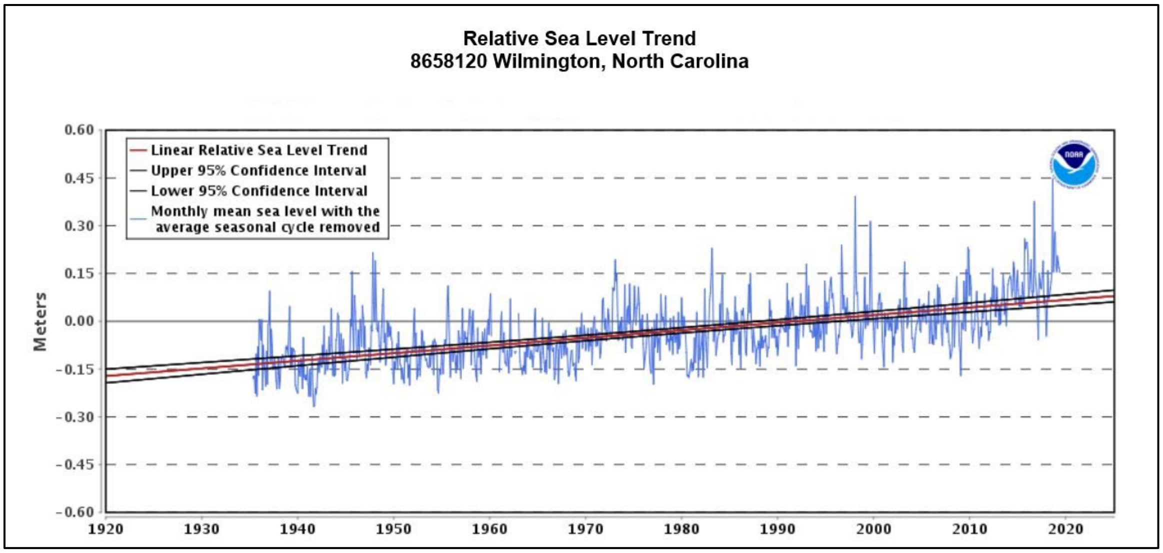

Figure 11. Relative Sea Level Trend, NOAA Gauge 8658120

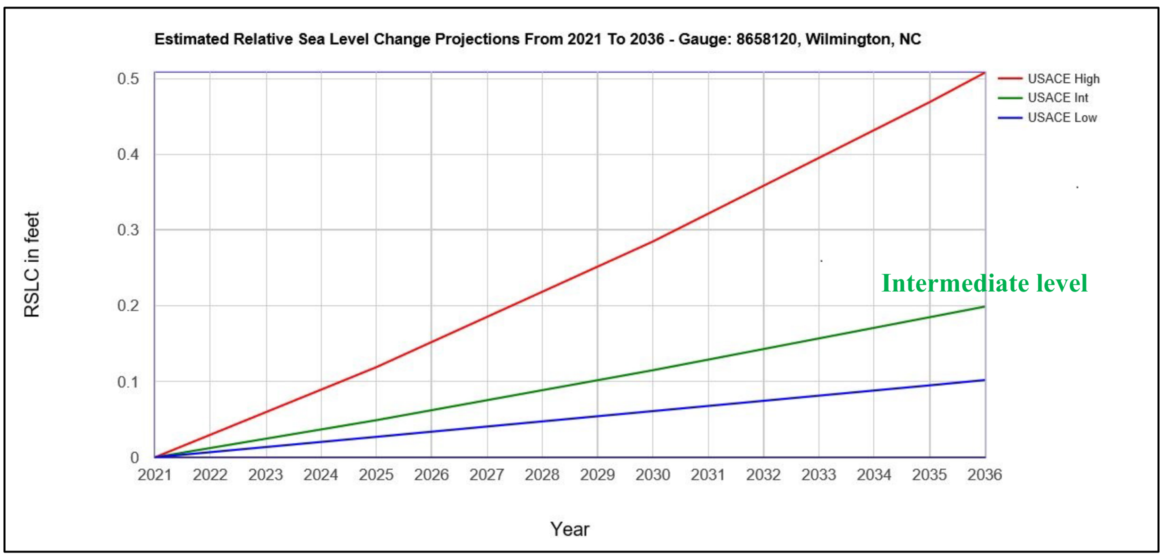

Figure 12. Project Sea Level Change, Start Year (FY 2021) to End of Project Life (FY 2036)

Alternative 1 (No Action) - No Emergency Repair

In general, relative sea level change (Baseline, Intermediate, and High) will not affect the overall function of the project. Relative vulnerability to flooding during extreme events is consistent between both No Action and the Proposed Plan. However, without the emergency repair, there is a greater risk of potential impacts of rising sea level on total water levels experienced in the project area include overtopping of waterside structures, increased shoreline erosion, and flooding of low-lying areas.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas

In general, relative sea level change (Baseline, Intermediate, and High) will not affect the overall function of the project. Relative vulnerability to flooding during extreme events is consistent between both No Action and the proposed action. However, the emergency repair will reduce the risk of potential impacts of rising sea level on total water levels experienced in the project area include overtopping of waterside structures, increased shoreline erosion, and flooding of low-lying areas.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
This alternative would have the same impacts as the proposed action.

3.13 Socioeconomics and Environmental Justice

Demographics

According to the US Census Bureau, the 2010 population of Wrightsville Beach was 2,477 (latest available census data), and the 2020 census showed the population at 234,473 for New Hanover County, making it the 9th most populous county in North Carolina. In the past several years, the county has seen strong population growth. Since 2010, the county has grown by over 17 percent. According to reports by the North Carolina State office of Budget and Management, New Hanover County is expected to increase in size to over 270,000 persons by 2029. The ethnic makeup of New Hanover County is 80.8 percent white, 12.5 percent African American, less than 1 percent Native American, 1.1 percent Asian, less than 1 percent Pacific Islander, and 2 percent from other races. 5.8 percent of the population were Hispanic or Latino of any race. From the 2010 data, Wrightsville Beach's racial makeup was 98.1 percent white, with less than 1 percent of each additional race represented. The Hispanic population in Wrightsville Beach represents less than 1 percent of the total population.

Economics

Emergency restoration is authorized by Public Law 84-99, Emergency Response to Natural Disasters and is at 100% federal cost. New Hanover County has a service-based economy that has benefited from an influx of permanent residents, and a thriving tourism industry. The service sector includes banking/finance, real estate, insurance, healthcare, and related commercial businesses. The percentage of the workforce employed in social services (defined as educational services, healthcare, or social assistance) is 13 percent, with the highest percentage of individuals working in the Finance-Insurance-Real Estate industry (24 percent), followed by Construction (15 percent).

With numerous notable attractions located in its borders and nearby, tourism is a critical component of the New Hanover County and Wrightsville Beach economy. In addition to miles of beaches, the county possesses numerous access points to the Intercoastal Waterway, which is popular for recreational fishing and boating related activities.

Income

On average, the socioeconomic composition of New Hanover County and Wrightsville Beach is higher than the remainder of North Carolina. The median household incomes are $51,232 and $77,232 respectively for the county and town, which is higher than the State average of $48,256. The per capita incomes in New Hanover County and

Wrightsville Beach are $31,708 and $69,591 respectively, both higher than the State average of $25,774.

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations states that the Federal government would review the effects of its proposed actions on low-income communities. Federal agencies are "to the greatest extent practicable and permitted by law" identify and address "as appropriate, disproportionately high and adverse human health and environmental effects of its programs, policies and activities on minority populations and low-income populations in the United States."

Minority and Low-Income Populations

The ethnic makeup of New Hanover County is 80.8 percent white, 12.5 percent African American, less than 1 percent Native American, 1.1 percent Asian, less than 1 percent Pacific Islander, and less than 2 percent from other races. 5.8 percent of the population were Hispanic or Latino of any race. Wrightsville Beach's racial makeup was 98.1 percent white, with less than 1 percent of each additional race represented. The Hispanic population in Wrightsville Beach represents less than 1 percent of the total population.

Any individual with total income less than an amount deemed to be sufficient to purchase basic needs of food, shelter, clothing, and other essential goods and services is classified as poor. The amount of income necessary to purchase these basic needs is the poverty line or threshold and is set by the Office of Management and Budget (www.census.gov). The 2018 poverty line for an individual under 65 years of age was $13,064. The poverty line for a three-person family with one child and two adults was $20,212. For a family with two adults and three children, the poverty line was $29,967 (www.census.gov).

On average, the socioeconomic composition of New Hanover County and Wrightsville Beach is higher than the remainder of North Carolina. The median household incomes are $51,232 and $77,232 respectively for the county and town, which is higher than the State average of $48,256. The per capita incomes in New Hanover County and Wrightsville Beach are $31,708 and $69,591 respectively, both higher than the State average of $25,774. In 2017, the poverty rate in New Hanover County was around 16.1 percent, and for children ages 0-17 the poverty rate increased to 23.5%.

The 2020 US Census data showed the minority/low-income populations and low-income communities are not found on Wrightsville Beach. Accordingly, the proposed action would not cause disproportionately high and adverse impacts on minority populations or low-income populations. No impacts to either minority/low-income populations or low income communities are anticipated as a result of the proposed action therefore the action would comply with EO 12898.

Alternative 1 (No Action) - No Emergency Repair

This alternative would not provide emergency repairs to Wrightsville Beach, increasing the risk of damages to critical infrastructure, residential, public and commercial structures. However, no disparate impacts to either minority/low-income populations or low-income communities are anticipated.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
This alternative would result in continued economic growth and would minimize damages to residential, public and commercial structures, as well as reduce damages to critical infrastructure. No impacts to either minority/low-income populations or low-income communities would occur.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
This alternative would have similar impacts as the proposed action.

3.14 Aesthetic and Recreational Resources

The project area beach is available for a multitude of beach recreation activities including swimming, surfing, wading, walking, sightseeing, picnicking, sunbathing, surf fishing, jogging, and so on. The total environment of barrier islands, beaches, ocean, estuaries, and inlets attracts many residents and visitors to the area to enjoy the total aesthetic experience created by the sights, sounds, winds and ocean sprays. Two ocean piers (Johnny Mercer's and Oceanic) are located in the project area and are considered important recreational facilities. During fall months, recreational surf fishing is a popular activity. These ocean piers, private recreational vessels, and charter boats that use the nearshore waters also contribute to the local economy.

The ocean and inlet, in the vicinity of the project area, would be affected to a minor extent in that dredges, barges, and other watercraft associated with the work would be on-site for the duration of the emergency repair. However, this is judged to be an insignificant effect since commercial and recreational vessels would be able to maneuver around the working dredge(s) and other equipment. Placement of beach fill would result in temporary use of a dredge pipeline, bulldozers, and other equipment on the beach. These objects would detract from the normal appearance of the beach, as well as create elevated levels of noise, vibration, lighting, etc. within the active project area. During nourishment, the active construction area would cover approximately 1,000 feet of the beach at one time. Progress along the beach for the repair would be expected to move at a relatively slow rate (i.e., about a mile per month or about 300 ft. per day). Also, recreational activities on beaches may experience some interruption or interference during work periods, but the degenerated, eroded conditions of the beaches already present recreational constraints.

Alternative 1 (No Action) - No Emergency Repair
This alternative would not repair Wrightsville Beach CSRM project, which would result in continued erosion of sand within the project area, reducing the total recreational beach area.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
Emergency repairs could cause a temporary reduction of aesthetic appeal and

interference with recreational activities on the beach. Placement of beach fill would result in temporary use of a dredge pipeline, bulldozers, and other equipment on the beach. These objects would detract from the normal appearance of the beach as well as create elevated levels of noise, vibration, lighting, etc. within the repair area. Also, recreational activities on beaches may experience some interruption or interference during work periods, but the degenerated, eroded conditions of the beach already present some recreational constraints. However, because work would be conducted in relatively small areas at a time, recreational and aesthetic impacts would be localized and temporary. After work is completed on the beach and the heavy equipment is removed, the resulting wider beach would be expected to represent an aesthetic enhancement and an improvement for recreation.

A steady-state WAVE model was used to evaluate the effects of offshore dredging to waves along Wrightsville Beach and Masonboro Island, which may impact surfing (Appendix G). The analysis showed the average wave height would change no more than 1/3 of an inch higher and no more than under an inch lower. The majority of the time the change in wave height was much smaller.

Effects on shore fishing would be limited to the area where material is being placed on the beach. Such localized temporary impact can easily be avoided by anglers in the area. Nearshore and offshore fishing boats could operate around the dredging equipment in the area. The dredging and placement would not be expected to affect inside fishing or the operation of commercial fishing boats operating in or going through Masonboro Inlet.

Unless there is extreme weather, the ocean-going dredge would operate continuously. Overall, short-term minor adverse and long-term beneficial effects would be expected on aesthetic and recreational resources.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
This alternative would have similar impacts as the proposed action; however, the inlet navigability may be affected in the short term when the dredge, barge, tug and crew boats associated with the work would be on-site. As a result, recreational boating navigability would be temporarily impacted. Also, average wave height is expected to be smaller than the proposed action due to dredging in the inlet versus offshore.

3.15 Commercial and Recreational Fishing

Commercial and recreational fishermen extensively utilize the nearshore marine and estuarine waters of North Carolina's northeast coast on a year-round basis. The USACE maintains navigation channels in the AIWW, Carolina Beach Inlet, and Masonboro Inlet that are actively fished, or provide passage to other waters, including the Atlantic Ocean. In addition, recreational surf fishermen frequently utilize area beaches.

Recreational fishing includes fishing from head boats, charter boats, private boats, piers, and the surf. Fishing from head boats is available year-round for various bottom fish including many snapper species, sea bass, grunts, and grouper. Fishing from charter boats is excellent for king mackerel, Spanish mackerel, sailfish, and a variety of bottom fish. Offshore, gulfstream species, like yellowfin tuna, mahi, and wahoo are available. Inside fishing has been successful for inshore species such as red drum, speckled trout, and flounder.

Private boat anglers can find bluefin tuna in the nearshore area, king mackerel, and other bottom fish species in the offshore, and other species such as speckled trout, red drum, and flounder can be found in the inside areas of the creeks and AIWW.

Alternative 1 (No Action) - No Emergency Repair
This alternative would have no effect on commercial and recreational fishing.

Alternative 2 (Proposed Action) - Emergency Repair Using Offshore Borrow Areas
The proposed action would have no effect on commercial and recreational fishing in the vicinity of Masonboro Inlet because there would be minimal inlet work that could impede traffic. Offshore work may temporarily impact fishing in the vicinity of the borrow areas, the transit route from the borrow areas to the pumpout station (hopper dredge) or along the pipeline route from the borrow areas (hydraulic cutterhead). Fishing vessels could easily avoid these areas and therefore impacts of the proposed action would be insignificant.

Alternative 3 - Emergency Repair Using Masonboro Inlet Borrow Area
During inlet dredging, fishing boat traffic would be temporarily delayed; however, during past dredging work in the inlet, boat traffic has been allowed to periodically navigate through the work area. Once dredging is completed, area mariners would benefit from the restored safe navigation conditions in the channel.

3.16 Environmental Commitments

The dredging and placement activities associated with the one-time emergency repair of the Wrightsville Beach CSRM project may have short-term environmental consequences as described in the ensuing text. The environmental goal of the project is to avoid and minimize adverse impacts to the environment to the maximum extent practicable.

With implementation of numerous environmental commitments to avoid and minimize impacts, the proposed action would not result in any significant impacts. The commitments include avoidance and minimization measures and should be considered preliminary. Some commitments may be modified pending new information acquired through the review process for this EA. In addition to the commitments listed in Table 11, the project will also comply with all requirements of the National Marine Fisheries Service (NMFS) 2020 SARBO.

Table 11. Environmental Commitments

	Environmental Commitments
1.	All derelict concrete, metal, and coastal armoring geotextile material and other debris must be removed from the beach prior to any sand placement to the maximum extent possible. If debris removal activities take place during the sea turtle nesting season, the work must be conducted during daylight hours only and must not commence until completion of the sea turtle nesting survey each day.
2.	Conservation Measures included in the permit applications/project plans must be implemented in the proposed project. If a Reasonable and Prudent Measure (RPM) and Terms and Conditions (T&C) address the same requirement, the requirements of the RPM and T&C take precedent over the Conservation Measure.
3.	During construction, trash and food items shall be disposed of properly either in predator-proof receptacles, or in receptacles that are emptied each night to minimize the potential for attracting predators of piping plovers, red knots, and sea turtles. All contractors and their employees must be briefed on the importance of not littering and keeping the Action Area free of trash and debris.
4.	A meeting between representatives of the contractor(s), the USACE, the Service, the NCWRC, the permitted sea turtle surveyor(s), and others, as appropriate, must be held prior to the commencement of work. At least 10 business days advance notice must be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle protection measures, as well as additional guidelines when construction occurs during the sea turtle nesting season, such as storing equipment, minimizing driving, and reporting within the work area, as well as follow-up meetings during construction.
5.	Pipeline placement must be coordinated between NCDCM, the USACE, the Service's Raleigh Field Office and the NCWRC.
6.	Only beach compatible fill must be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. Beach compatible fill must be sand solely of natural sediment and shell material, containing no construction debris, toxic material, or other foreign matter, or large amounts of granular material, gravel, or rock. The beach compatible fill must be similar in both color and grain size distribution (sand grain frequency, mean and median grain size and sorting coefficient) to the native material in the Action Area. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system.
7.	During dredging operations, material placed on the beach shall be inspected daily to ensure compatibility. If during the sampling process non-beach compatible material, including significant amounts of tire debris, is or has been placed on the beach all work shall stop immediately and the Service and NCWRC will be notified by the USACE and/or its contractors to assist in determining the appropriate plan of action.
8.	From May 1 through November 15, to the maximum extent practicable, excavations and temporary alteration of beach topography (outside of the active construction zone) will be filled or leveled to the natural beach profile prior to 9:00 p.m. each day.
9.	If any nesting turtles are sighted on the beach during construction, construction activities must cease immediately until the turtle has returned to the water, and the sea turtle permit holder responsible for nest monitoring has marked for avoidance or relocated any nest(s) that may have been laid. If a nesting sea turtle is observed at night, all work on the beach will cease and all lights will be extinguished (except for those absolutely necessary for safety) until after the female has finished laying eggs and returned to the water.
10.	During the sea turtle nesting season, the contractor must not extend the beach fill more than 1,000 feet along the shoreline and must confine work activities within this area between dusk and dawn of the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. A permitted sea turtle surveyor must be present on-site to ensure no nesting and hatchling sea turtles are present within the work area. Once the beach has been cleared and the necessary nest relocations have been completed, the contractor will be allowed to proceed with the placement of fill and work activities during daylight hours until dusk at which time the 1,000-foot length limitation must apply. If a nesting sea turtle is sighted on the beach within the immediate construction

	area, activities must cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has relocated the nest. If movement of equipment up or down the beach (outside of the active nighttime construction area) is required between dusk and dawn, an additional nighttime monitor must accompany vehicles operating on the beach, watching for signs of turtle activity ahead of the vehicle. If activity is discovered, the vehicle must stop or reverse direction until the activity ceases and the monitor clears the forward progress of the vehicle. Movement of equipment up or down the beach during nighttime operations would be conducted from the off-beach access point to the construction area and vice-versa (traveling from the off-beach access point to the construction area).
11.	If any work on the beach is conducted during the sea turtle nesting season (May 1 through November 15), the USACE shall submit a lighting plan for the equipment and dredge that will be used in the project. The plan shall include a description of each light source that will be visible on or from the beach and the measures implemented to minimize this lighting. The plan shall be reviewed for approval by the Service.
12.	Direct lighting of the beach and nearshore waters must be limited to the immediate construction area during the nesting season and must comply with safety requirements. Lighting on all equipment must be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment must be reduced to the minimum standard required by OSHA for General Construction areas, in order to not misdirect sea turtles. Shields must be affixed to the light housing and be large enough to block light from all on-beach lamps from being transmitted outside the construction area or to the adjacent sea turtle nesting beach
13.	Access points for construction vehicles, including vehicles needed for debris removal, must be as close to the project site as possible. Construction vehicle travel down the beach must be limited to the maximum extent possible.
14.	From May 1 through November 15, staging areas for construction equipment must be located off the beach. Nighttime storage of construction equipment not in use must be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach must be located as far landward as possible without compromising the integrity of the dune system. Pipes placed parallel to the dune must be 5 to 10 feet away from the toe of the dune if the width of the beach allows. If pipes are stored on the beach, they must be placed in a manner that will minimize the impact to nesting habitat and must not compromise the integrity of the dune systems.
15.	Demobilization of equipment from the beach must be conducted only during daylight hours, after the daily survey for sea turtle nests has been completed. Any nests that are identified must be marked for avoidance as described above, and avoided during all demobilization activities.
16.	The dredge should avoid areas of known debris in the borrow area and cease operations and move away from an area if large amounts of debris are found. Records should be kept regarding the timing of when the debris containers are emptied. A map showing areas dredged and relative amounts of debris should be developed and distributed to the Service and other agencies weekly.
17.	When a container of screened material is full, pumping should cease until an empty replacement container can be installed. Containers should not be allowed to overflow.
18.	Tire material and other debris shall not be stockpiled on the beach, but removed to an upland location when a container is full.
19.	Beach raking of areas where construction is complete must be conducted only during daylight hours, after the daily survey for sea turtle nests has been completed. Any nests that are identified must be marked for avoidance as above, and avoided during all beach raking activities.
20.	Tire debris must be removed from all stretches of nourished beach, to at least a depth of 36 inches. Raking equipment must utilize the smallest mesh or tines possible to maximize debris removal. If needed, future debris removal efforts (after 2022) will be addressed in a separate BO.
21.	The design of a restored or constructed dune should include as steep a waterward slope as possible. The restored/constructed dune should tie into the pre-existing dune without loss of elevation, to avoid development of a "trough" between the existing dune and the constructed dune.
22.	Visual surveys for escarpments along the Action Area must be made immediately after completion of sand placement, and within 30 days prior to May 1 for two subsequent years after any construction or sand placement event. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in

	height for a distance of 100 feet must be leveled and the beach profile must be reconfigured to minimize scarp formation by the dates listed above. Any escarpment removal must be reported by location. If the sand placement activities are completed during the early part of the sea turtle nesting and hatching season (May 1 through May 30), escarpments must be leveled immediately, while protecting nests that have been relocated or left in place. The Service must be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the Service or NCWRC will provide a brief written authorization within 30 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken must be submitted to the Service's Raleigh Field Office.
23.	Sand compaction must be qualitatively evaluated at least once after each sand placement event. If the Service or NCWRC determine that additional inspections are needed, a second inspection may be required prior to May 1 of the following year. Compaction monitoring and remediation are not required if the placed material no longer remains on the beach. Within 14 days of completion of sand placement and prior to any tilling (if needed), a field meeting shall be held with the Service and/or NCWRC to inspect the project area for compaction and determine whether tilling is needed.
24.	As part of the North Carolina Sea Turtle Protection Project, and with the help of Federal and local agencies and volunteer groups, annual surveys of sea turtle activity have and continue to occur along Wrightsville Beach. It is recommended that these surveys continue, with or without a project in place.
25.	The proposed project limits avoid the inlet vicinity at both ends of Wrightsville Beach which have historically been areas of consistently higher amaranth abundance. The Seabeach amaranth monitoring will involve 5 monitoring events: 1) The first during the summer following initial sediment placement, 2) the second summer after placement, 3) the summer before the first renourishment, 4) the summer following renourishment, and 5) the second summer after renourishment. These 5 monitoring events should be sufficient to determine if using offshore borrow areas are impacting seabeach amaranth.

3.17 Environmental Impact Comparison of Alternatives

Table 12. Summary and Comparison of Impacts

Resource	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Emergency Repair Using Masonboro Inlet Borrow Area
Geology and Sediments	Continued erosion of sand within the CSRM project area, increasing risks of storm damage.	Increased quantity of sediment in Masonboro Inlet could result in increased shoaling in Masonboro and Mason Inlets. Removal of approximately 1,250,000 CY from offshore borrow w/placement of approximately 1,000,000 CY on the beach. Impact of 364 acres of previously undisturbed area.	Similar to the proposed action but impacting approximately 154 acres within the previously disturbed borrow area. No increase in shoaling and no need for separate navigation dredging.
Water Quality	No effect.	Short-term and minor, localized, increase in turbidity. This may result in more dredging of the federally-maintained Masonboro Inlet to ensure safe navigation, thereby increasing the amount of dredging required as compared to the past use of Masonboro Inlet as borrow source. This may result in an increase in the number of dredging events in Masonboro Inlet, directly increasing temporary impacts on water quality.	Impacts are similar to the proposed action, but with fewer dredging days and no increase in number of dredging events of Masonboro Inlet.
Wetlands and Floodplains	No changes to wetlands or hydrology, but the continued erosion would cause permanent loss of land area in the floodplain along the Wrightsville Beach oceanfront.	Insignificant changes throughout the project area and therefore will not alter existing hydrology in the floodplain.	Same as the proposed action.
Surf Zone and Nearshore Ocean Fishes	No effect.	Insignificant entrainment impacts Overall, impacts would be temporary, minor and insignificant.	Impacts similar to the proposed action but shorter construction time reduces entrainment and duration of increased turbidity.
Nekton	No effect.	Insignificant impacts from entrainment. Overall impacts would be temporary, minor and insignificant.	Impacts similar to the proposed action but shorter construction time reduces entrainment and duration of increased turbidity.
Larval Entrainment	No effect.	Insignificant impacts from entrainment. Overall impacts would be temporary, minor and insignificant.	Similar to the proposed action, but with a slight increase of impacts due to inlets as important passageways for larval transport.
Benthic Resources	No effect.	Short-term, and reversible negative effects on intertidal macrofauna within the 77- acre area.	Similar to the proposed action, but disturbance of 154 acres of previously

		Disturbance of previously undisturbed 364 acres of benthos in the offshore borrow area. minor insignificant impacts but expected to return in 1-2 years.	disturbed benthos.
EFH and HAPC	No effect.	Short-term and minor impacts. Overall, no significant impacts.	Impacts similar to the proposed action but of shorter duration.
Birds	Eroded beach, negatively impacting foraging and resting areas along the ocean front.	Beach nourishment activities could temporarily affect the roosting and intertidal macro-fauna foraging and offshore foraging habitat. Overall, no significant effects.	Similar to the proposed action but of shorter duration. Increased risk of impacts due to pipeline placement at the inlet. Overall, no significant effects.
Air Quality	No effect.	Temporary increases in exhaust emissions and greenhouse gases. Emission increases would be minor, temporary and of short duration.	Similar to the proposed action but impacts would be of shorter duration.
Noise	No effect.	Overall, impacts minor and short-term impacts, not significant.	Similar to the proposed action but of with elevated noise of shorter duration.
Threatened and Endangered Species	Continued erosion of the beach within the CSRM project area, increasing risks to sea turtles, piping plover, red knot and seabeach amaranth.	Potential impacts to the manatee, piping plover, red knot, green, hawksbill, Kemp's leatherback and loggerhead sea turtle, Atlantic sturgeon, NARW and seabeach amaranth due to dredging and placement.	Impacts of this alternative would be similar to the proposed action; however, the risk of vessel strikes to NARW in the inlet with a hydraulic cutterhead dredge is less than the potential risk of one or two hopper dredges offshore and transiting back and forth to the sand pumpout location. This alternative would also further reduce the risk due to fewer total dredging days (45) as compared to the proposed action (likely 110 or 55).
Cultural Resources	No effect.	No effect.	No effect.
Climate Change	Increased frequency and intensity of storm events will likely increase erosion rates.	Increased frequency and intensity of storm events will likely increase erosion rates; these impacts will be reduced by repair.	Same as the proposed action.
Sea Level Change	Greater risk of potential impacts of rising sea level on total water levels experienced in the project area include overtopping of waterside structures, increased shoreline erosion, and flooding of low-lying	Reduced risk of potential impacts of rising sea level on total water levels experienced in the project area include overtopping of waterside structures, increased shoreline erosion, and flooding of low-lying areas.	Same as the proposed action.

	areas.		
Socioeconomics and Environmental Justice	Increased risk of damages to critical infrastructure, residential, public and commercial structures. No impacts to either minority/low-income populations or low-income communities.	Continued economic growth and minimize damages to residential, public and commercial and critical structures. No impacts to either minority/low-income populations or low-income communities.	Same as the proposed action.
Recreation and Aesthetic Resources	Continued erosion of sand within the CSRM project area, and reduction of the total recreational beach area.	Overall, short-term minor adverse and long-term beneficial effects would be expected on aesthetic and recreational resources.	Similar to the proposed action, but with a short-term effects to inlet navigability.
Commercial and Recreation Fishing	No effect.	Minor and temporary impacts to fishing in vicinity of borrow areas, transit route from the borrow areas to the pumpout station (hopper dredge) or pipeline route from the borrow areas (cutterhead). Overall impacts would be insignificant.	Similar to the proposed action, but during inlet dredging, fishing boat traffic would be temporarily delayed and overall fewer total dredging days (45) as compared to the proposed action (likely 110).

3.18 Cumulative Effects

Historically, the extent of beach renourishment activities on North Carolina beaches was limited to a few authorized Federal projects including: Wrightsville Beach, Carolina and Kure Beaches, and Ocean Isle Beach. However, in the past 20 years, a significant number of Federal and non-Federal beach renourishment efforts were pursued to provide coastal storm risk management along the increasingly developed North Carolina shoreline. Additionally, the number of non-Federal beach renourishment projects has increased in recent years in efforts to initiate coastal storm risk management measures while awaiting funding for Federal projects (i.e. Bogue Banks, Dare County, North Topsail Beach, Surf City and Topsail Beach). Considering the extent of coastal development and subsequent vulnerability to long and short-term erosion throughout the North Carolina shoreline, it is possible that many of the proposed Federal and non-Federal beach renourishment projects may be constructed in the future. Furthermore, the frequency of beach placement activities for protection of infrastructure will continue throughout the state, resulting in cumulative time and space crowded perturbations. Assuming projects continue to adhere to environmental commitments for the reduction of environmental impacts, and un-developed beaches throughout the state continue to remain undisturbed, it is likely that adjacent un-impacted and/or recovered portions of beach will be available to support dependent species (i.e. surf zone fish, shore birds, etc.) and facilitate recovery of individual project sites to pre-project conditions. Assuming recovery of impacted beaches and the sustainability of un-developed protected beaches (i.e. National/Federal and State Parks and Estuarine Reserves), the potential impact area from the proposed and existing actions is small relative to the area of available similar habitat on a vicinity and statewide basis. Additionally, due to the widespread distribution and small acreage relative to the available unimpacted sites, the cumulative impacts to the borrow sources would be minimal.

4 STATUS OF ENVIRONMENTAL COMPLIANCE

The USACE is the lead federal agency under the NEPA process and associated environmental compliance activities. Pursuant to 40 CFR 1501, the Bureau of Ocean Energy Management (BOEM) is serving as a cooperating agency as the project proposes to utilize a series of potential borrow areas in federal waters adjacent to the project site. BOEM has jurisdiction, by law, over mineral leasing in the Outer Continental Shelf beyond three miles. A non-competitive negotiated agreement with the BOEM will be obtained before any work is started. BOEM will also serve as a cooperating agency for consultation requirements related to ESA Section 7 (50 CFR 402), NHPA Section 106 (36 CFR 800), Subpart C Consistency (15 CFR 930), Magnusson-Stevens Section 305 (50 CFR 600), Endangered Species Act (ESA) and National Historic Preservation Act (NHPA).

4.1 National Environmental Policy Act (NEPA)

On May 20, 2022, the CEQ issued an update to its regulations for Federal agencies to implement the NEPA. This EA has been prepared in accordance with the updated NEPA, the Council on Environmental Quality regulations (40 Code of Federal Regulations (CFR) parts 1500- 1508,1515-1518). To ensure the EA included an assessment of impacts on all significant resources in the project area, the Wilmington District circulated a scoping letter, dated September 13, 2021, requesting comments to identify significant resources and issues of concern. Comments received were considered in the development of this EA. The USACE held a virtual scoping meeting, with resource agencies on October 6, 2021, to discuss renourishment of Wrightsville Beach every four years until 2036 and to solicit input regarding associated resource impacts and impact minimization measures. Agencies represented on the call included the National Marine Fisheries Service Habitat Conservation Division, North Carolina Division of Coastal Management, the US Fish and Wildlife Service, North Carolina Audubon Society, and the North Carolina Department of Environmental Quality. Since that time, the USACE has modified the scope of the project covered in this EA to one emergency renourishment with identification of a new offshore borrow area. A periodic renourishment was planned for FY 2022, but changes in the interpretation of relevant provisions of the Coastal Barrier Resources Act (CBRA) currently prohibit the use of the Masonboro Inlet/Banks Channel borrow area, the historic borrow area source (Figure 1). The search for a new borrow area delayed the planned periodic renourishment to FY 2023.

In 2019, Hurricane Dorian caused significant sand loss to Wrightsville Beach, ultimately resulting in the need for emergency repair as authorized by PL 84-99. The emergency repair will restore the Wrightsville Beach CSRM project template, to the same extent as a periodic renourishment. Including the repair planned for 2023, a total of four more renourishment events, once every four years, are planned. Since the EA only addresses the emergency repair to be accomplished in 2023, a second EA will be completed to address the remaining three renourishment cycles for the Wrightsville Beach CSRM project to the end of its project life of 2036.

4.2 North Carolina Coastal Zone Management Program

The action addressed in this EA will take place in the designated coastal zone of the State of North Carolina. Pursuant to the Federal Coastal Zone Management Act (CZMA) of 1972, as amended (P.L. 92-583), Federal activities are required to be consistent to the maximum extent practicable with the federally approved coastal management program of the state in which their activities would be occurring.

Along with a copy of the draft EA for emergency repair of the Wrightsville Beach CSRM project, the USACE has submitted a consistency determination to the N.C. Division of Coastal Management (CAMA) in accordance with Section 307 (c) (l) of the Federal Coastal Zone Management Act of 1972, as amended.

The Coastal Resources Commission designates areas as Areas of Environmental Concern (AEC) to protect them from uncontrolled development, which may cause irreversible damage to property, public health or the environment, thereby diminishing their value to the entire state. The following determinations have been made regarding the consistency of the proposed action with the State's management objective for each of the areas affected:

- **Public Trust Areas –** These areas include waters of the Atlantic Ocean and the lands thereunder from the mean highwater mark to the 3-mile limit of state jurisdiction.

The offshore borrow area is predominantly located within these Public Trust Areas. Acceptable uses include those that are consistent with protection of the public rights for navigation and recreation, as well as conservation and management to safeguard and perpetuate the biological, economic, and aesthetic value of these areas. The activities that comprise the proposed action are not intended to adversely impact the public's rights for navigation and recreation, and are consistent with conservation of the biological, physical, and aesthetic values of public trust areas.

- **Estuarine Waters –** Estuarine Waters are the state's oceans, sounds, tidal rivers and their tributaries, which stretch across coastal North Carolina and link to the other parts of the estuarine system: public trust areas, coastal wetlands and coastal shorelines.

For regulatory purposes, the inland, or upstream, boundary of estuarine waters is the same line used to separate the jurisdictions of the Division of Marine Fisheries and the NC Wildlife Resources Commission. However, many of the fish and shellfish that spend part of their lives in estuaries move between the "official" estuarine and inland waters.

Although the current proposed action would not use Masonboro Inlet/Banks Channel as a borrow source, utilization as a borrow source could be considered if Federal funding restrictions of CBRA were not applicable. If so, short-term adverse impacts to the estuarine and ocean system would occur.

- **Ocean Erodible –** The Ocean Erodible AEC covers North Carolina's beaches and any other oceanfront lands that are subject to long-term erosion and significant shoreline changes. The seaward boundary of this AEC is the mean low water line. The landward limit of the AEC is measured from the first line of stable natural vegetation and is determined by adding a distance equal to 60 times the long-term average annual erosion rate for that stretch of shoreline to the distance of erosion expected during a major storm. The width of the AEC varies from about 145 feet to more than 700 feet.

The proposed action would not adversely affect oceanfront lands at Wrightsville Beach. In fact, the repair (nourishment) of the beach using beach quality sand from the offshore borrow area onto the Wrightsville Beach CSRM project will reduce the erosion and storm damage potential.

- **Inlet Hazard –** This AEC covers lands next to ocean inlets. Inlet shorelines are especially vulnerable to erosion and flooding and can shift suddenly and dramatically. For each inlet along the coast, the Division of Coastal Management prepares a hazard area map that is reviewed and approved by the Coastal Resources Commission. Each area is mapped based on a statistical analysis of inlet migration, previous inlet locations, narrow or low lands near the inlet, and the influence of man-made features, such as jetties and channelization projects.

The lands adjacent are not part of the project area and are not inhabited.

4.3 Clean Water Act

Section 401

Pursuant to Section 401 of the Clean Water Act of 1977 (P.L. 95- 217), as amended, a Water Quality Certification (WQC) is required for this proposed project. The proposed action is covered under the North Carolina Division of Water Resources December 1, 2017, Water Quality General Certification (WQC) No. 4153: General Certification for Emergency Dredging. All conditions of the water quality certification will be implemented to minimize adverse impacts to water quality.

Section 404

Pursuant to Section 404 of the Clean Water Act, the impacts associated with the discharge of fill material into waters of the United States are discussed in the Section 404(b)(1) (P.L. 95-217) Guidelines Analysis in Appendix D. Discharges associated with dredging in the offshore borrow areas are considered incidental to the dredging operation, and therefore, are not being considered as being a discharge addressed under the *Section 404(b)(1) Guidelines Analysis*. There are no practicable alternatives that would have a less adverse effect on the aquatic environment, therefore, the proposed action is the least environmentally damaging practicable alternative (LEDPA).

4.4 Endangered Species Act

Previously the USACE and USFWS completed informal consultation on the development of the Wrightsville Beach Validation Report, and also completed formal consultation on the Wrightsville Beach, North Carolina, Coastal Storm Risk Management project in 2016. Formal consultation has been initiated for the Wrightsville Beach Emergency Repairs. The USACE and BOEM submitted a Biological Assessment to the USFWS and received the Wrightsville Beach Coastal Storm Risk Management Emergency Repairs Using Offshore Borrow Area Biological Opinion dated January 5, 2023 (Appendix E) issued for this one-time emergency repair.

The USACE will accomplish the emergency repair in accordance with the 2020 NMFS South Atlantic Regional Biological Opinion utilizing the appropriate conservation measures and the risk analysis described in Section 2.9.2.2.

4.5 Magnuson-Stevens Fishery Conservation and Management Act

Potential project effects on EFH species and their habitats have been evaluated and are addressed in Section 3.5 of this document. It has been determined that the proposed action would not have a significant adverse effect on such resources. By coordination of this document with the NMFS, consultation was officially initiated and concurrence with the USACE findings was requested. Compliance obligations related to EFH provisions of the 1996 congressional amendments to the MSFCMA (P.L. 94-265) would be fulfilled before initiation of the proposed action.

4.6 Coastal Barrier Resources Act (CBRA)

The Coastal Barrier Resources Act (CBRA), enacted in October 1982, established resource units on undeveloped coastal barriers within which federal spending is restricted. Coastal Barrier Resources System (CBRS) Unit L09 (Figure 1), established subsequent to the passage of the Act, includes the entirety of Masonboro Inlet and a portion of the Banks Channel borrow area. The previous Wrightsville Beach CSRM study report (Validation Study) included an evaluation of the use of the Masonboro Inlet/Banks Channel as a borrow source and, in accordance with the Department of Interior’s interpretation at the time, the USFWS granted approval for use of the Masonboro Inlet/Banks Channel during the 2019 CBRA consultation. However, under the subsequent Department of Interior interpretation, the use of Federal funds to remove material from this borrow source is currently restricted. Therefore, the proposed action would utilize an offshore borrow source that is not located within a CBRS unit. In the event that Masonboro Inlet and the portion of Banks Channel are no longer subject to the Federal funding restrictions contained in the CBRA, those areas could potentially be utilized as a borrow source. Any future utilization of the Masonboro Inlet/Banks Channel borrow area will be coordinated with the USFWS prior to any work performed.

4.7 Public Laws and Executive Orders

Table 13. The Relationship of the Proposed Action to Federal Laws and Policies

Title of Public Law	US CODE	*Compliance Status
Abandoned Shipwreck Act of 1987	43 USC 2101	Full Compliance
Anadromous Fish Conservation Act of 1965, As Amended	16 USC 757 a et seq.	Full Compliance
Antiquities Act of 1906, As Amended	16 USC 431	Full Compliance
Archeological and Historic Preservation Act of 1974, As Amended	16 USC 469	Full Compliance
Archeological Resources Protection Act of 1979, As Amended	16 USC 470	Full Compliance
Clean Air Act of 1972, As Amended	42 USC 7401 et seq.	Full Compliance
Clean Water Act of 1972, As Amended	33 USC 1251 et seq.	Full Compliance
Coastal Zone Management Act of 1972, As Amended	16 USC 1451 et seq.	Full Compliance
Endangered Species Act of 1973	16 USC 1531	Full Compliance
Estuary Protection Act of 1968	16 USC 1221 et seq.	Full Compliance
Equal Opportunity	42 USC 2000d	Full Compliance
Farmland Protection Policy Act	7 USC 4201 et seq.	Full Compliance
Fish and Wildlife Coordination Act of 1958, As Amended	16 USC 661	Full Compliance
Historic and Archeological Data Preservation	16 USC 469	Full Compliance
Historic Sites Act of 1935	16 USC 461	Full Compliance
Magnuson Fishery Conservation and Management Act – Essential Fish Habitat	16 USC 1801	Full Compliance
National Environmental Policy Act of 1969, As Amended	42 USC 4321 et seq.	Full Compliance
National Historic Preservation Act of 1966, As Amended	16 USC 470	Full Compliance
National Historic Preservation Act Amendments of 1980	16 USC 469a	Full Compliance
Native American Religious Freedom Act of 1978	42 USC 1996	Full Compliance

Executive Orders		
Protection and Enhancement of Environmental Quality	11514/11991	Full Compliance
Protection and Enhancement of the Cultural Environment	11593	Full Compliance
Floodplain Management	11988	Full Compliance
Protection of Wetlands	11990	Full Compliance
Federal Actions to Address Environmental Justice and Minority and Low-Income Populations	12898	Full Compliance
Implementation of the North American Free Trade Agreement	12889	Full Compliance
Invasive Species	13112	Full Compliance

*Full compliance once the NEPA process is complete.

4.8 Coordination of this Document

The draft EA is being circulated for a 30-day review and comment period to a comprehensive list of Federal, State and local agencies, as well as pertinent government officials, interested stakeholders and individuals. All comments received during public review will be considered and specifically addressed in the final EA.

5 CONCLUSION

Based on findings described in this EA, it is in the federal interest to implement the proposed action for emergency repair of the Wrightsville Beach CSRM project. Any additional impacts of the proposed action compared to the No Action alternative, may result in minor and short-term impacts to geology and sediments, water quality, surf zone and nearshore ocean fishes, nekton, larval entrainment, benthic resources, birds, essential fish habitat and habitat areas of particular concern, noise, threatened and endangered species, socioeconomics, recreation and aesthetic resources, and commercial and recreational fishing. The proposed action will have no effect on wetlands, floodplains or cultural resources. This project will not increase the effects of climate change in the project area; however, the project area is likely to be affected by climate change due to the proximity of the project to the coast where effects of climate change, such as increased storm events and sea level rise, will likely be more dramatic than inland portions of the State. Increased frequency and intensity of storm events will likely increase erosion rates which may increase the need for larger, or more frequent, renourishments to maintain coastal storm risk management benefits. Relative sea level change will not affect the overall function of the project. However, emergency repair will reduce the risk of potential impacts of rising sea level on total water levels experienced in the project area include overtopping of waterside structures, increased shoreline erosion, and flooding of low-lying areas

The USACE will use the SARBO risk-based assessment framework to evaluate risk to all species and habitat in the area by considering the possible routes of effects based on project location, timing, equipment, and minimization measures available. The assessment will consider the risks and benefits at a local, regional, and national level and prioritize protection of the most vulnerable species based on population status and the best-available information.

Though time and space crowded perturbations are expected in the reasonably foreseeable future, assuming each project adheres to project related impact avoidance measures, it is likely that adjacent unimpacted and/or recovered portions of beach will be available to support dependent species and facilitate recovery of individual project sites to pre-project conditions. When combined with the impacts of other foreseeable projects in the south Atlantic, potential impacts to borrow sites or to beaches on which the material is placed would be minimal.

The Proposed Action would not significantly impact the quality of the human environment. If this opinion is upheld following circulation and review of this EA, a FONSI will be signed and circulated.

6 POINT OF CONTACT

Any comments or questions regarding this EA should be addressed to: Eric Gasch, Eric.K.Gasch@usace.army.mil.

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