US Army Corps of Engineers ®
Wilmington District

DRAFT ENVIRONMENTAL ASSESSMENT
EAGLE ISLAND IMPROVEMENTS
DIKE RAISE TO ELEVATION 50 FEET

Eagle Island Confined Disposal Facility,
Upper Wilmington Harbor, Cape Fear River
Brunswick and New Hanover Counties
North Carolina

July 2016

DRAFT ENVIRONMENTAL ASSESSMENT

EAGLE ISLAND IMPROVEMENTS, DIKE RAISE TO 50 FEET
BRUNSWICK AND NEW HANOVER COUNTIES, NORTH CAROLINA

JULY 2016

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1.0 INTRODUCTION

Wilmington Harbor, located on North Carolina's southeast coast, is one of the state's two deep-water ports and a major contributor to its economy. The Wilmington Harbor project connects deep water of the Atlantic Ocean with North Carolina State Ports facilities at Wilmington, waterfront facilities in downtown Wilmington and several businesses north of the City of Wilmington, by way of a 38-mile-long channel along the Cape Fear River. The U. S. Army Corps of Engineers (USACE), Wilmington District, is responsible for maintaining the federally authorized Wilmington Harbor navigation project. The primary disposal facility for dredged material from the Upper Harbor reaches of the Wilmington Harbor is the Eagle Island Confined Disposal Facility (CDF), which is located on the peninsula between the Cape Fear and Brunswick Rivers, south of U.S. Highway 74/76 (Figure 1). Improvements to the Eagle Island CDF is required to provide adequate dredged material disposal capacity for continued maintenance dredging of the Wilmington Harbor navigation project. This Environmental Assessment (EA) addresses the improvement of Cells 1, 2, and 3 of the Eagle Island CDF in relation to other alternatives.

The National Environmental Policy Act of 1969, as amended (NEPA), requires consideration of the environmental impacts for major federal actions. The purpose of this EA is to ensure the environmental consequences of the proposed action are considered and that environmental and project information are available to the public. This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations (CFR) parts 1500- 1508), and Engineering Regulation (ER) 200-2-2.

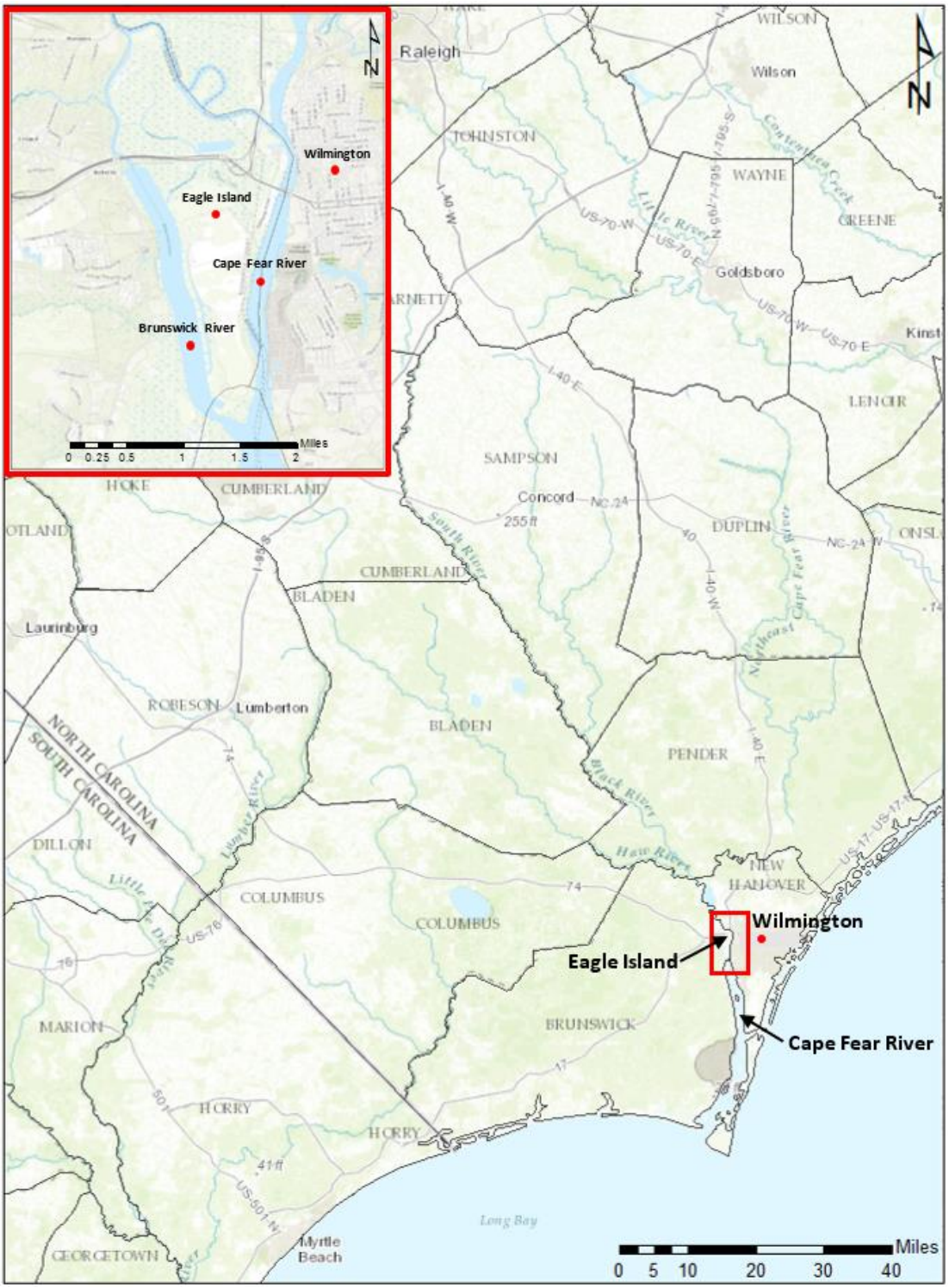

Figure 1. Geographical location of Eagle Island, Wilmington, North Carolina

1.1 Incorporation by Reference

The USACE has produced a number of environmental and planning reports which describe the Wilmington Harbor federal navigation project, its ongoing and proposed improvements, the details of dredging and disposal operations required for its construction and maintenance, and the environmental aspects of the project. A number of these reports, which contain extensive background information, are listed below and are incorporated by reference.

U.S. Army Corps of Engineers, Wilmington District. October 1989. Final Environmental Impact Statement (FEIS). Long-Term Maintenance of Wilmington Harbor, North Carolina. This document describes project history, physical and biological attributes of the harbor, dredging and disposal methods and alternatives, capacities and estimated life expectancies of disposal areas, and anticipated environmental impacts of harbor maintenance.

U.S. Army Corps of Engineers, Wilmington District. June 1996. Final Feasibility Report and Environmental Impact Statement on Improvement of Navigation, Cape Fear - Northeast Cape Fear Rivers Comprehensive Study, Wilmington, North Carolina, Volumes I, II, and III.

U. S. Army Corps of Engineers, Wilmington District. June 1996. Final Supplement I to the Final Environmental Impact Statement for Wilmington Harbor Channel Widening, New Hanover and Brunswick Counties, North Carolina.

U. S. Army Corps of Engineers, Wilmington District. 1996. Preliminary Assessment, Dredged Material Management Plan (DMMP), Wilmington Harbor, NC.

U. S. Army Corps of Engineers, Wilmington District. 1997. Dredged Material Management Plan, Phase I Study, Wilmington Harbor, NC.

U. S. Army Corps of Engineers, Wilmington District. February 2000. Environmental Assessment, Preconstruction Modifications of Authorized Improvements, Wilmington Harbor, NC.

U. S. Army Corps of Engineers, Wilmington District. August 2000. Finding of No Significant Impact, Preconstruction Modifications of Authorized Improvements, Wilmington Harbor, NC.

U. S. Army Corps of Engineers, Wilmington District. 2001. Phase II Dredged Material Management Plan Study, Volumes I-V, Upper Portion of Wilmington Harbor, NC.

U.S Environmental Protection Agency and U. S. Army Corps of Engineers, Wilmington District. November 2001. Final Environmental Impact Statement, New Wilmington Ocean Dredged Material Disposal Site Designation.

U. S. Army Corps of Engineers, Wilmington District. June 2012. Environmental Assessment, Continued Construction of Authorized Improvements, Wilmington Harbor 96 Act, Wilmington Harbor, NC.

U. S. Army Corps of Engineers, Wilmington District. August 2012. Finding of No Significant Impact, Continued Construction of Authorized Improvements, Wilmington Harbor 96 Act, Wilmington Harbor, NC.

1.2 Wilmington Harbor Project Background

The Wilmington Harbor Federal navigation project begins at the ocean bar to the entrance of the Cape Fear River. It extends through the approximate center of the river, and small islands border the channel for much of its length. These islands were created by disposal of dredged material in open water prior to the early 1970s. The Wilmington Harbor navigation channel is divided into “reaches” or segments of river, and dredging methods and disposal options vary depending on the reach location and quality of material to be dredged (Figure 2).

The following are the authorized dimensions and approximate dredging intervals of the Wilmington Harbor reaches that utilize Eagle Island for the disposal of dredged material:

- Lower Brunswick Channel through the Anchorage Basin channel to the Cape Fear River Memorial Bridge (~24.5 miles), including the 1200 foot wide turning basin that consists of an authorized depth of -42 feet mlw with an allowable overdepth of 2 feet to -44 feet. This portion is dredged every one to two years;
- From the Cape Fear Memorial Bridge up to 750 feet above the Hilton Railroad Bridge on the Northeast Cape Fear River (~3.6 miles) consists of an authorized width of 250 feet and a depth of -38 feet (-39 feet required in areas containing rock) with allowable overdepth of 2 feet to -40 feet, to include the 800-foot wide turning basin. The turning basin is located at the northern end of downtown Wilmington. This portion is dredged every 3 to 4 years;
- From 750 feet above the Hilton Railroad Bridge for approximately 1.3 miles to the project’s northern terminus to include the most northern 800 foot wide turning basin consists of an authorized depth of -34 feet with an allowable overdepth of 2 feet to -36 feet. This portion is has not been dredged since 1994.

Eagle Island is divided into 5 cells, of which 3 cells are in active use. Measured from the top of dike inward, from South to North, Cell 1 consists of approximately 230 acres, Cell 2 is approximately 260 acres, and Cell 3 is approximately 265 acres. Each cell contains spillway structures that allow for the discharge of effluent (water from dredged material) into either the Brunswick River or the Cape Fear River (see Figure 3). For each dredging event, typically only one cell is used. This allows for a revolving schedule of dewatering, ditching, drying, maintenance, and dike-raising of the other two cells.

In a typical dredging project, material is dredged by a hydraulic cutter suction dredge and pumped into a disposal area cell. The calculated capacity of the receiving cell includes a minimum of two feet of freeboard (the vertical distance between the maximum elevation of the effluent inside the cell and the top of the dike). This freeboard allows safe inspection of the dike, prevents overtopping and minimizes the chance of a dike breach. The effluent is contained within the cell while suspended sediment settles. The “clear” effluent flows out of the cell via one or more spillways or by pumping. Turbidity, or cloudiness, of the receiving water is analyzed in compliance with NC Department of Water Resources water quality standards. The rate of effluent is manually controlled at the spillway riser or by the rate of pumping of dredged material out of the cell.

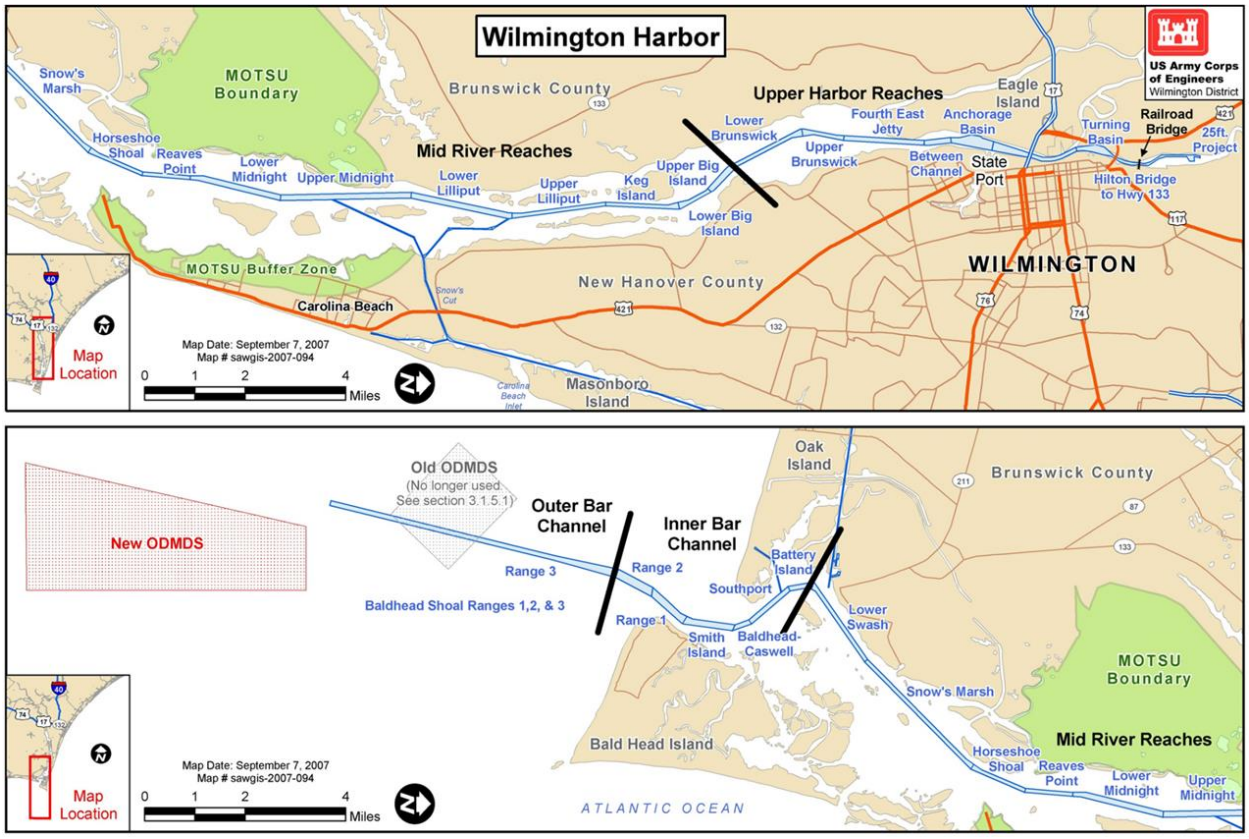

Figure 2. Reaches of the Wilmington Harbor

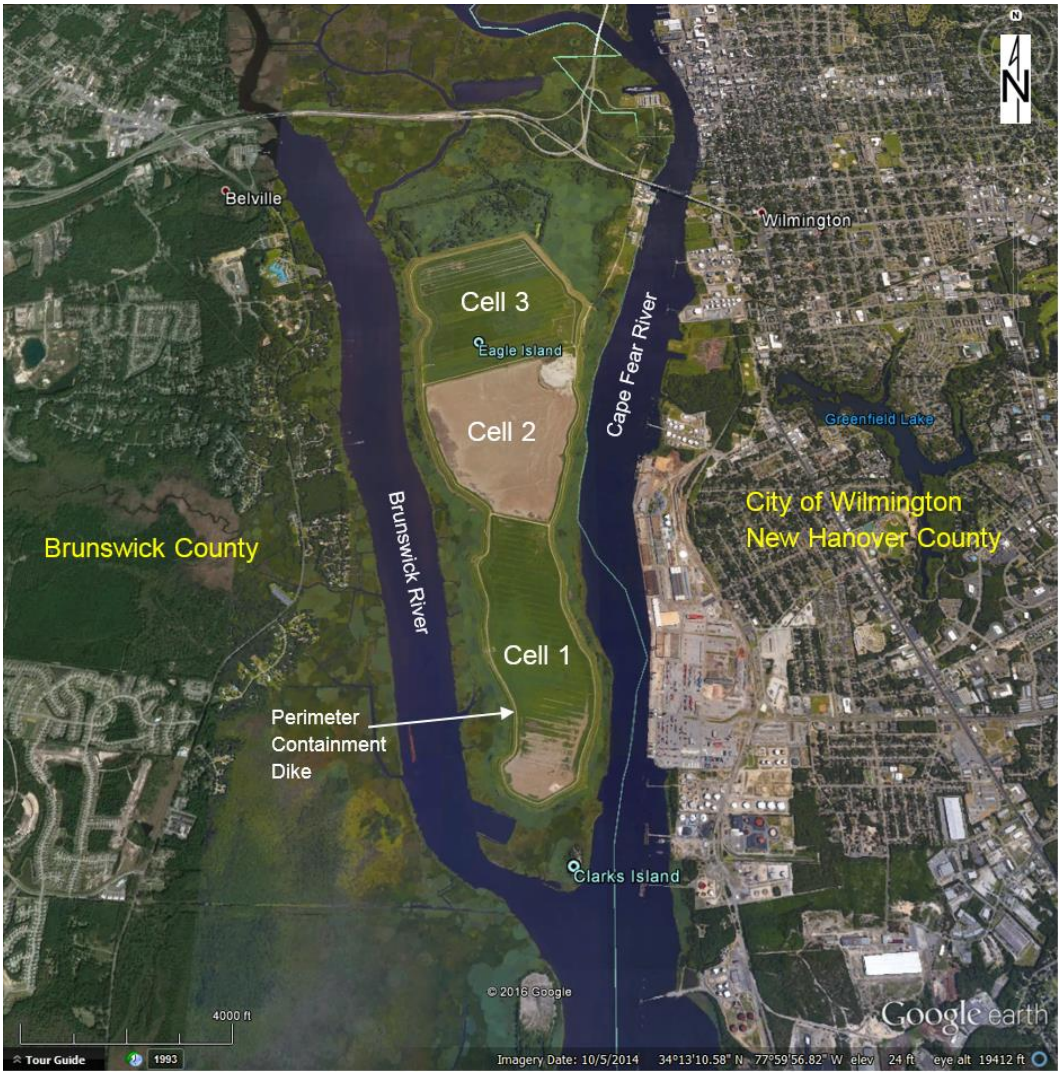

Figure 3. Eagle Island Cells 1 - 3

2.0 PURPOSE AND NEED

Since the early 1900's, the Upper Harbor reaches of Wilmington Harbor have been dredged using a hydraulic cutter suction dredge with disposal of the dredged material in designated disposal areas located adjacent to the channel. The Eagle Island CDF, which has been the primary disposal site for this dredged material, is rapidly filling up. Phase I of the Eagle Island Dike Improvement Project is currently underway. Phase I includes the increase of the dike heights at each of the 3 cells. The existing dikes on Cell 1 have been raised to elevation 40 feet (NAVD 88), and Cells 2 and 3 are being raised to 42 feet (NAVD 88). Cell 1 is complete and Cells 2 and 3 will be under construction through the summer of 2018. These dike raises will not increase the footprint of the Eagle Island CDF, rather, they will be done with dike step-ins and raises to the interior of the existing dikes. Although these improvements will increase disposal capacity, the increased capacity will only last approximately 5-6 years (allowing for at most another 6 dredging and disposal cycles). Therefore, the need remains for

additional dredged material disposal capacity for the Upper Harbor reaches, beyond the dike raises currently underway.

The purpose of this project is to ensure that adequate disposal capacity is available for continued maintenance of the Upper Harbor reaches of the Wilmington Harbor navigation project, and that dredged material disposal meets the federal standard. Pursuant to 33 C.F.R. § 335.7, the federal standard mandates that the dredged material disposal alternative(s) identified by USACE represent the least costly alternative(s), consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process or ocean dumping criteria.

3.0 PROPOSED ACTION

The Eagle Island CDF is located on a 1,473-acre tract owned by the Department of the Army. The original property boundary for the site was defined by a series of rivers and creeks, some of which still exist and serve as property boundaries for the site. Eagle Island dikes were initially constructed in the late 1970's and now encompass approximately 755 acres of diked uplands, which was originally composed of uplands and tidal marsh as well as several tidal creeks. Over successive years of dredged material disposal, the marsh and creeks were filled and the CDF was created. Outside of the existing CDF dikes, the majority of acreage within the 1,473-acre tract is considered jurisdictional wetlands. Historically, the site was divided into two cells, a north and a south cell. However, as part of the 2000 improvement to the CDF, the north cell was subdivided into two cells of approximately equal size. As a result, material dredged from the Upper Harbor reaches is disposed of, on a rotating basis, in Eagle Island Cells 1, 2, and 3.

The most feasible alternative for providing future disposal capacity is to increase the capacity of Cells 1-3 at Eagle Island by raising the dikes to elevation 50 feet NAVD 88. To ensure dike stability, this additional raise will require the construction of a "toe berm" around portions of the outer footprint of each cell (see Figure 4). The toe berm will serve as a buttressing-type support for the dike, allowing additional dike raises in increments of 3 to 5 feet, eventually reaching a maximum elevation of 50 feet NAVD 88. The toe berms and dike raises will be constructed utilizing existing material in the cells. Doing so will also increase the capacity of each cell providing additional storage space for future disposal.

Although the USACE would prefer to construct the toe berm for all three cells at the same time, this may not be possible based upon funding limitations. Therefore, construction of the toe berm would be accomplished in a phased approach that may occur over a period of up to 5-6 years beginning in 2018, as funding becomes available. The proposed dike raise to elevation 50 feet NAVD 88 would provide disposal capacity for an additional 10-12 years (until year 2032).

Construction of the dike raises and toe berms will impact approximately 39 acres of coastal marsh. Mitigation proposed to offset these impacts is discussed in Section 5.16. The proposed improvements to Eagle Island CDF fulfills the purpose and need

described above, as it ensures that adequate disposal capacity is available for continued maintenance of the Upper Harbor reaches of the Wilmington Harbor navigation project, and that the dredged material disposal meets the federal standard.

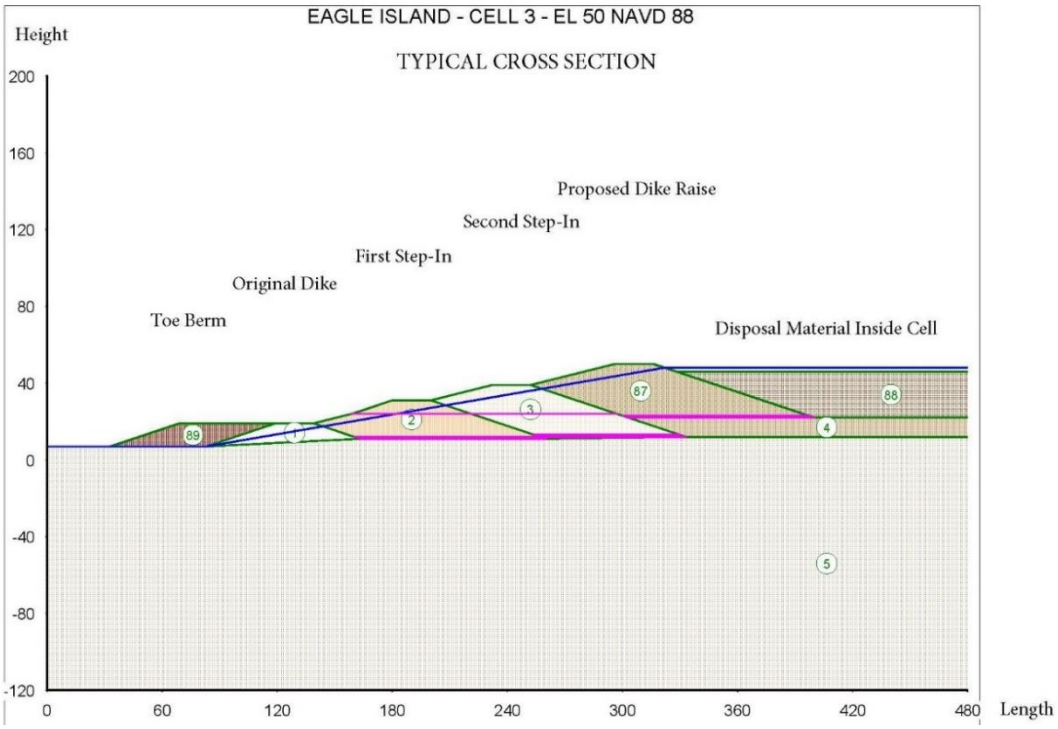

Figure 4. Typical Cross Section of Proposed Dike Raise and Toe Berm

4.0 ALTERNATIVES CONSIDERED BUT ELIMINATED

4.1 Disposal in the Wilmington Ocean Dredged Material Disposal Site (ODMDS)

Once capacity at Eagle Island CDF is exhausted, the only other currently available disposal method is to perform bucket and barge dredging and dispose of the material in the ODMDS. The assumed dredge for this is a 21 CY clamshell dredge and the barges are assumed to be 3,000 CY dump scows. Environmental restrictions prohibit overflow from the barges, which limits the amount of dredged material that can be placed in each scow. A 90% capacity and 50% fill ratio are assumed as average. This would also result in an additional 1.2 million cubic yards of material going to the ODMDS every year. Disposal of dredged material from the Upper Harbor reaches into the ODMDS would cost significantly more than dike improvements and disposal in Eagle Island CDF.

4.2 Development of Cells 4 & 5

This alternative would involve the development of two new cells (Cells 4 and 5) located just to the north of Cell 3. Cells 4 and 5 would act as a direct dredged material disposal site or as storage area for dry material from Cells 1-3. The former would require construction of perimeter dikes and spillway structures to facilitate the disposal of excess water from the dredged material slurry. Dike construction would likely require a minimum of 3 years and would need to start within the next 4 years to be available for

use before Cells 1, 2 and 3 are full. Dikes at Cells 4 and 5 would have to be constructed to an approximate elevation of 40 feet NAVD 88 to provide a 15-year project life, and to elevation 60 feet NAVD 88 to provide capacity for up to 20 years.

Cells 4 and 5 could also be developed as a dry storage area. This would be accomplished by drying material in Cells 1-3 and dry hauling to Cells 4 and 5 to restore some capacity in Cells 1-3. Material would be placed in small layers across the site, eliminating the need for dikes and spillways. Erosion control would be provided as required.

Use of Cells 4 and 5 for disposal or storage will require upfront mitigation costs. It is estimated that the majority of the footprint of the proposed cells (approximately 160 acres) contains coastal wetlands that are of relatively high function and value. The current cost to mitigate for one acre is $175,147 according to the NC Division of Mitigation Services (DMS) In-Lieu Fee (ILF) Program, resulting in a mitigation cost of roughly $28 million. This cost is significantly higher than implementing the proposed Eagle Island dike raise to 50 feet, and for this reason, construction of Cells 4 and 5 was eliminated from further consideration.

4.3 New Upland CDF

Another measure considered was the construction of a new upland disposal site. To be viable, a new site would have to be at least 1,000 acres and similar in proximity to the harbor as the Eagle Island disposal site. Aerial photography of the area was used to identify any potential future sites 1,000 acres in size within a radius of 2 miles of the Harbor. Analysis revealed that there are no undeveloped uplands of the size available to construct a new disposal site. Undeveloped wetlands would require mitigation fees as stated above, that would render the project impracticable.

Due to a lack of undeveloped uplands in the harbor vicinity, construction of a new disposal site is not viable. Moreover, if directly pumping into the disposal area is not possible due to the distance, material may have to be double-handled and trucked to the disposal area. Due to the close proximity of Eagle Island, an upland alternative further inland would be more costly to construct and utilize than disposal in Eagle Island CDF or the ODMDS. For these reasons, construction of a new upland disposal site was eliminated from further consideration.

4.4 Raise Eagle Island Dikes to Elevation of 52 feet and 62 feet

Raising the Eagle Island dikes to the elevation of either 52 feet or 62 feet was also analyzed. These were the original heights considered for the project. There are significant stability and settlement issues with raising the Cell 1, 2 and 3 dikes above elevation 50 feet NAVD 88. Raising the dikes to these heights may result in stability issues or a breach of the dikes, which would result in potential water quality issues or impediments to navigation in the river. Geotechnical evaluations indicate that neither of these heights are economically feasible; therefore, this plan was eliminated from further consideration.

5.0 AFFECTED ENVIRONMENT & IMPACTS OF PROPOSED PLAN & NO ACTION

The focus of this EA is the improvements to Eagle Island Cells 1 – 3 to increase their capacity for future disposal. Therefore, the affected environment consists of resources in the vicinity of Eagle Island and the impacts associated with implementation of the proposed action as compared to No Action. Impacts associated with continuing dredging and disposal operations will not be addressed, as they have been addressed in previous NEPA documents.

The No Action alternative would be the continuance of currently utilized disposal practices at Eagle Island CDF and completion of the current dike raises at Cells 2 and 3 to elevation 42 feet NAVD 88. The Cell 1 dike cannot be raised above 40 feet without the construction of toe berms. Dike raises at Cells 2 and 3 to 42 feet NAVD 88 are being done with step-ins to the interior of the dike. Since toe berms are not required for this raise, the overall footprint would not change. These improvements will add approximately 1 year of capacity for a total of six years of volume life at Eagle Island CDF. Beyond that time, Eagle Island will no longer have the capacity to accept dredged material. Therefore, dredging projects that previously disposed of dredged material at Eagle Island CDF will require transport to another approved disposal location. Currently, the only disposal area suitable for this fine-grained dredged material is the ODMDS. The ODMDS is located in the Atlantic Ocean, offshore of the mouth of the Cape Fear River, approximately 38 miles from the upper reaches of the Wilmington Harbor navigation project.

5.1 Geology and Sediments.

Dredged material deposited in Eagle Island CDF is entirely from maintenance dredging work in the Upper Harbor reaches of the Wilmington Harbor project. Sediments in the Wilmington Harbor project area have been routinely tested and evaluated and grain-sizes have been, and continue to be, periodically determined throughout the life of the project. Sediments previously deposited in Cells 1-3 of Eagle Island will be used to construct the proposed improvement project.

The physical and chemical character of Wilmington Harbor shoaled material was most recently evaluated in 2013. Multiple composite samples, representing specific dredging units throughout the Wilmington Harbor project, underwent physical and chemical testing. For sediment originating in the project's upper reaches (near the NC State Ports facilities and the Anchorage Basin), about 85% of material was organic silt and clay with sand comprising about 15%, by weight. Arsenic, Anthracene, and Fluorene were the primary contaminants of concern for this material, and were detected above both the threshold effect level (TEL) and effects range-low (ERL) in at least one of the two composited samples. However, all NC State Ports facilities and Anchorage Basin material is permitted for disposal in both Eagle Island CDF and the Wilmington Harbor ODMDS.

Dike Raises to 50 Feet. The proposed dike raise would increase the footprint of Cells 1-3 by approximately 80 acres (see Figures 5 & 6). This will be due to the construction of a

necessary support berm at the toe of the existing dike. The toe berm will be at heights ranging from a top elevation of approximately 20-27 feet, surround portions of all 3 cells, and will be constructed from existing material from the inside of the cells. Depending on the condition of the existing dikes, the top surface width of the toe berm would vary from 25 to 120 feet. Sections of dike around Cell 1 appear to be the most unstable, requiring the most added width for support.

The proposed dike raise should have no impact on the project area's geology or sediments. Once toe berms are in place and dike raises are achieved, disposal practices from the Wilmington Harbor project will continue as normal and dredged material composition is not expected to change.

No Action. Continuing dredged material disposal with no dike raise will have no impact on the project area's geology or sediments as the footprint of the cells and dikes on Eagle Island would not change.

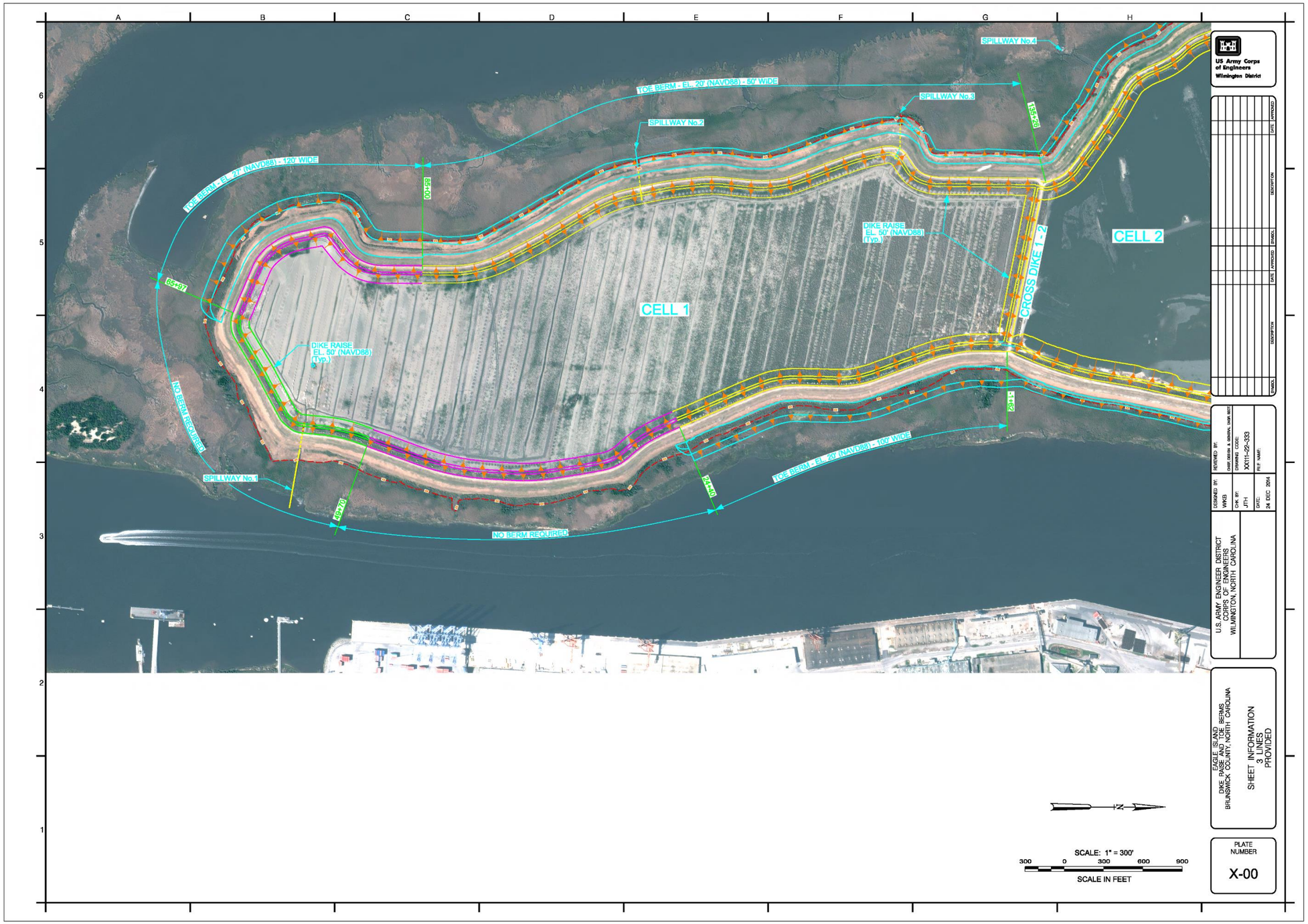

Figure 5. Footprint of the 50' Toe Berm for Cell 1

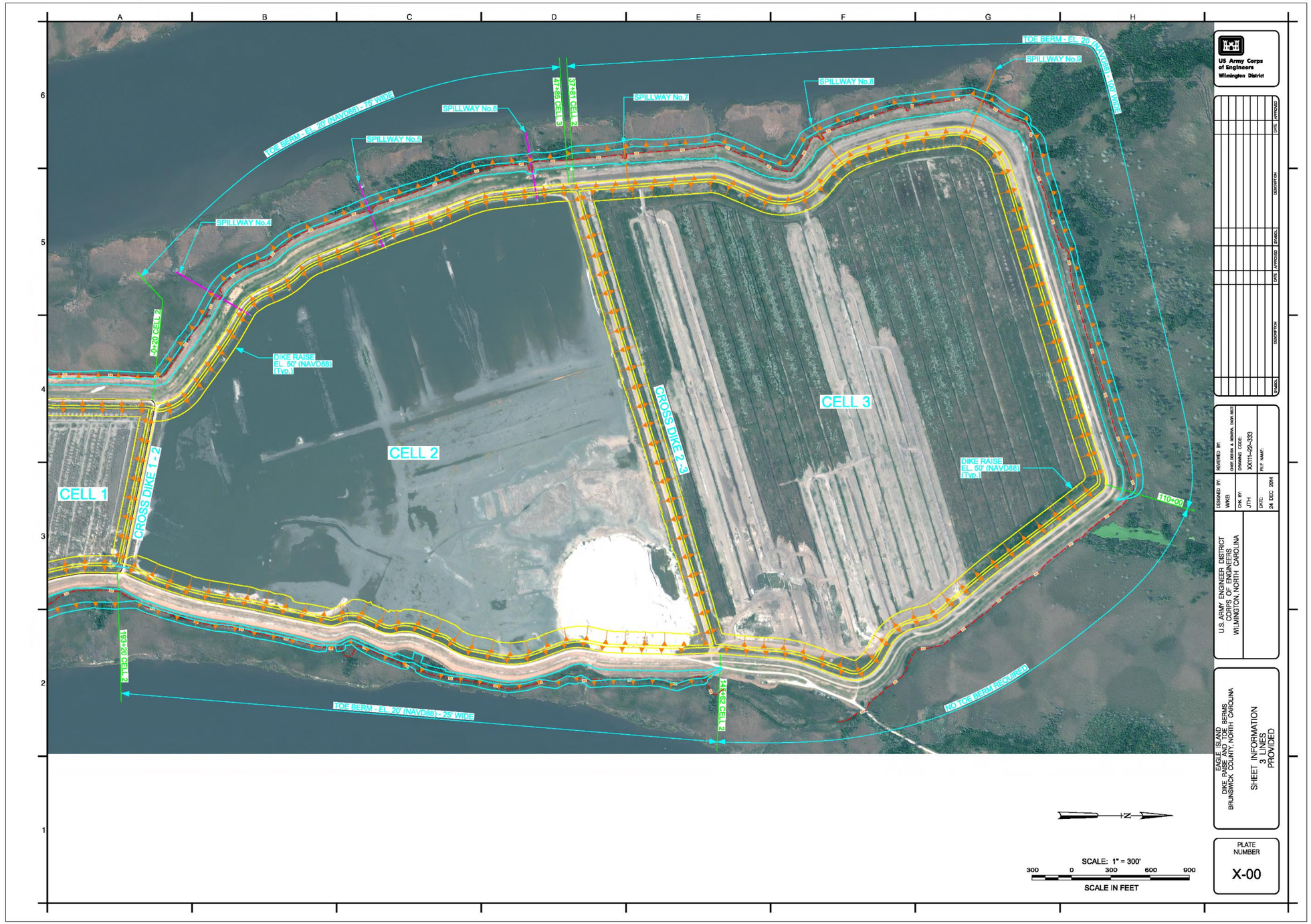

Figure 6. Footprint of the 50' Toe Berms for Cells 2 & 3

5.2 Water Resources.

5.2.1 Water Quality. The Cape Fear River naturally carries a large amount of sediment from inland to the Atlantic Ocean and drains broad areas of coastal plains. The relatively slow moving water allows higher concentrations of tannins, essentially making the river a blackwater system. These, combined with the relatively heavy marine industrial traffic and urban development along both sides of the River and its tributaries, can affect the River's water quality, including clarity. During times of poorer water quality due to high suspended sediment loads, pollution, runoff, submerged aquatic vegetation and associated fauna, marshes, and nektonic communities (fish, shellfish, and marine reptiles and mammals) may be adversely impacted.

The EPA has developed a system to identify drainage areas by assigning a Hydrologic Unit Code (HUC) to watersheds. The Cape Fear River's HUC is 03030005. The NC Division of Water Resources designates classifications for surface water bodies in the State. These classifications define the best uses to be protected within each water body. Cape Fear River from Snows Point to Federal Point to Atlantic Ocean = SA;HQW and Brunswick River = SC.

The classification definitions are:

- Class SA = Tidal salt waters that are used for commercial shellfishing or marketing purposes. All SA waters are also HQW by supplemental classification.
- Class SC = All tidal salt waters protected for secondary recreation such as fishing, boating, and other activities involving minimal skin contact; fish and noncommercial shellfish consumption; aquatic life propagation and survival; and wildlife.
- High Quality Waters (HQW) = Supplemental classification intended to protect waters which are rated excellent based on biological and physical/chemical characteristics through Division monitoring or special studies, primary and other functional nursery areas designated by the Marine Fisheries Commission.

5.2.2 Hydrology. Tides in the project area are semidiurnal and the mean tidal range (difference between mean high water and mean low water) at Downtown Wilmington is approximately 4.3 feet. The mean tidal range in the Atlantic Ocean near its confluence with the Cape Fear River is between 5 and 6 feet.

The River's salinity is approximately 35 parts per thousand (ppt) at its confluence with the Atlantic Ocean. Salinity decreases upstream and near Downtown Wilmington fluctuates within the brackish (0.5 – 30 ppt) range; the salinity dependent upon inflow from the upper Cape Fear, the Brunswick River, and the Northeast Cape Fear River.

Dike Raises to 50 Feet. Elevating the dikes around Cells 1-3 would require the construction of an outer toe berm to support the structure. Estimated impacts of the toe berm are approximately 39 acres of coastal marsh. Filling this low-lying area would convert wetlands into uplands, displacing water and any potential habitat that exists. Adverse impacts to water quality resulting from the toe berm construction would be short-

lived and within levels required by the appropriate water quality certification (to be requested and obtained by the Division of Water Resources). All efforts to reduce sedimentation and turbidity and control erosion during construction will be required. The preferred alternative would have no adverse effect on the project or surrounding area's hydrology.

No Action. Under the No Action alternative, no impacts will occur to wetlands or waters as the footprint of the existing CDF will not change.

5.3 Air Quality.

New Hanover and Brunswick Counties are currently listed as in "attainment" status for all Criteria pollutants which have a National Ambient Air Quality Standard (NAAQS) published with the exception of Sulfur Dioxide (SO2). Both Counties are currently listed as "unclassifiable" for SO2 by the EPA like most of the rest of the country (with the exception of some areas which have a SO2 monitor which clearly shows a violation - these are listed as "nonattainment"). This pollutant recently (over 2 yrs. ago) received a revised (lowered) NAAQS value. EPA has yet to publish clear regulatory guidance directing states how to satisfactorily demonstrate attainment status for counties in the nation, thus the newly made up attainment status term "unclassifiable". The project area in New Hanover and Brunswick Counties is considered as having a status of "attainment/unclassifiable". (Personal communication, Mr. Brad Newland, Regional Supervisor, NC Department Environmental Quality, Division of Air Quality, Wilmington Regional Office, November 18, 2014).

Dike Raises to 50 Feet. Temporary increases in exhaust emissions from construction equipment are expected during construction of dike raises and toe berms. The State of North Carolina has a State Implementation Plan ("SIP") approved or promulgated under Section 110 of the Clean Air Act (CAA), as amended. However, a conformity determination is not required because Brunswick and New Hanover Counties have been designated by the State of North Carolina as attainment/unclassifiable areas, and the direct and indirect emissions from the project fall below the prescribed *de minimus* levels (58 Fed. Reg. 93.153(c)(1)). Therefore, no conformity determination would be required. The preferred alternative is not anticipated to result in any adverse effects on the air quality of Brunswick and New Hanover Counties' attainment areas. The project would be in compliance with Section 176 (c) of the CAA, as amended.

No Action. The No Action alternative would not result in any adverse effect on the air quality in this two-county attainment/unclassifiable area other than an increase in fuel consumption and the resultant exhaust emissions due to round trip travel to/from the ODMDS when disposal in Eagle Island CDF is no longer viable. Even with this type of increase, the project would remain in compliance with Section 176 (c) of the CAA, as amended.

5.4 Marine and Estuarine Resources

5.4.1 <u>Nekton</u> Nekton collectively refers to aquatic organisms capable of controlling their location through active movement rather than depending upon water currents or gravity for passive movement. In the project area, there are estuarine and fresh water species such as: largemouth bass (*Micropterus salmoides*), pickerel (*Esox americanus*), sunfish (*Lepomis* spp), crappie (*Pomoxis* spp), bluegill (*Lepomis macrochirus*), and speckled trout (*Cynoscion nebulosus*).

The Cape Fear River is a 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 marshes and shallow water habitats within the project area's estuarine waters serves as nursery habitat where young fish undergo rapid growth before returning to the offshore environment.

The State of North Carolina defines Primary Nursery Areas (PNAs) as tidal saltwater, which provide essential habitat for the early development of commercially important fish and shellfish (15 NCAC 3B .1405). It is in these estuarine areas that many fish species undergo initial post-larval development. PNAs are designated by the North Carolina Marine Fisheries Commission. The Cape Fear River PNAs are defined as follows: "all waters north of a line beginning on the west shore at a point 34° 10.4410' N - 77° 57.7400' W; running easterly through Beacon "59" to the east shore to a point 34° 10.4050' N - 77° 57.1310' W; with the exception of the maintained channel, and all waters north of a line beginning on the west shore at a point 34° 04.6040' N - 77° 56.4780' W; running easterly through Beacon "41" to the east shore to a point 34° 04.7920' N - 77°55.4740' W; with the exception of 300 yards east and west of the main shipping channel up to Beacon "59" (mouth of Brunswick River)". Map #27 from the NC Division of Marine Fisheries' website, (http://portal.ncdenr.org/web/mf/primary-nursery-areas), depicts the PNAs within the project area (see Figure 6).

Secondary Nursery Areas (SNAs) are defined by rule 15 NCAC 3N .0102(c) as: "…. those areas in the estuarine system where later juvenile development takes place. Populations are usually composed of developing sub–adults of similar size which have migrated from an upstream primary nursery area to the secondary nursery area located in the middle portion of the estuarine system." These areas are located adjacent to PNAs, are generally deeper and contain mixed populations of large juveniles, sub-adults, and adults.

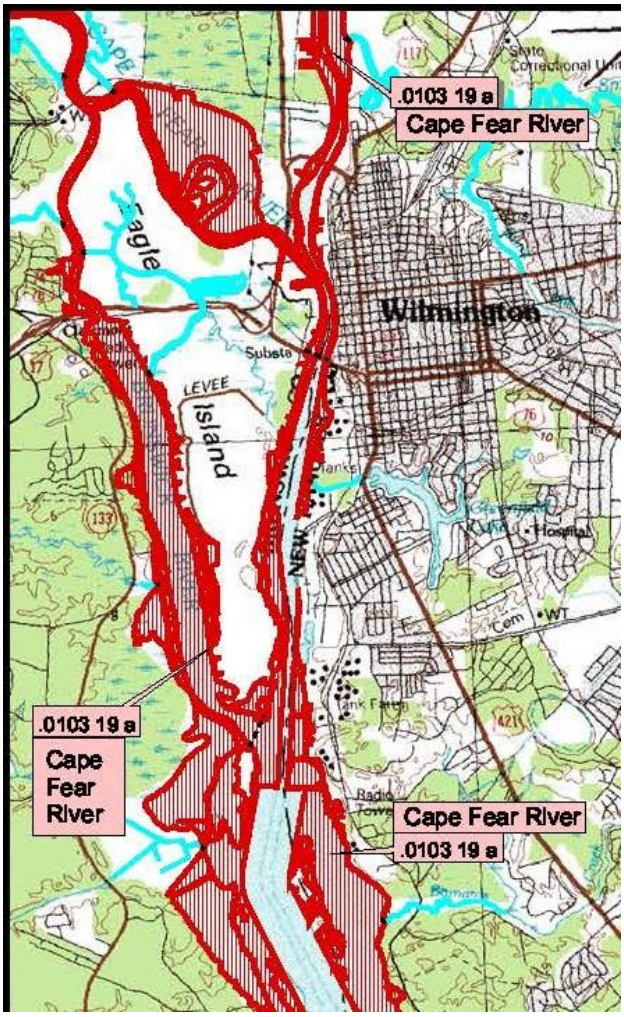

Figure 7. Identified PNA (areas within red lines) in the project area.

5.4.2 Benthos. Aquatic organisms that live in close association with the bottom, or substrate, of a body of water, are collectively called the benthos. Common benthic organisms in these sediments would likely include polychaetes, amphipods, decapods, and mollusks. Given the susceptibility of the project area to currents, water movement, water depths, and the amount of suspended sediment, large benthic communities and large numbers of organisms are not expected.

Lawler, Matusky & Skelly Engineers (1975) conducted a benthic investigation at six stations ranging from near the mouth of the Cape Fear River up to the mouth of Smith Creek in the Northeast Cape Fear River. Polychaetes dominated the benthic fauna below MOTSU. Of the 21 species collected, only five species occurred above Snows Cut and only one species at Smith Creek. Species included (*Scolecolepides virdis*), (*Capitella capitata*), (*Branchioasylis americana*), (*Drilonereis longa*) and (*Nereis succinea*). Oligochaetes were the most abundant group in the entire river, comprising 35% of all collected fauna. They were most abundant from Campbell Island to the Anchorage Basin. Amphipods (*Gammarus* spp.) occurred in all samples but were most abundant near MOTSU, the Anchorage Basin and at Smith Creek. Other common

species collected were Cumaceans and Isopods.Woodward-Clyde Consultants (1980) surveyed the benthos in the vicinity of the Anchorage Basin. Nematodes, the spionid polychaete (*S viridis*), and the isopod (*Chiridotera almyra*) were dominant in the medium-fine sand. The silty clay substrate was dominated by the oligochaete (*Peloscoles benedeni*) and by an amphipod (*Gammarus* sp).

Shellfish beds are present in the Cape Fear Estuary; however, they are primarily south of Snows Cut (Woodward-Clyde Consultants 1980) well south of the area of potential effect for the proposed Eagle Island CDF improvements.

5.4.3 Intertidal Macrofauna. Intertidal portions along the fringes of Eagle Island are inhabited by various species of polychaete worms and amphipods. These organisms are important food sources for numerous bird species that may be present in the area.

5.4.4 Submerged Aquatic Vegetation (SAV). A category of Essential Fish Habitat (below), SAV beds form a complex and important ecosystem. SAV are not prolific in the Cape Fear River or adjacent waters and there are none in waters around Eagle Island. Although SAV can quickly populate shallow bottom when conditions are conducive, the currents, deeper depths, and amount of suspended sediments minimizing light penetration in the water column will limit the likelihood that SAV will populate the majority of the project area.

Dike Raises to 50 Feet. Nekton and benthos are not anticipated to be adversely impacted by the proposed project as they are expected to move and avoid areas during construction. Some mortality is inevitable, however numbers would be negligible in relation to overall populations. Impacts associated with construction are expected to be minimal, temporary, and short-lived. Because SAV is not present in the marsh around Eagle Island, it would not be impacted.

The construction of toe berms would impact approximately 39 acres of emergent intertidal marsh fringing Eagle Island. Construction of the toe berm would occur between October 1 and January 31 to avoid impacts to fisheries within the PNA areas. Although the impacted marsh is vegetated primarily with *Phragmites*, there are some intertidal macrofaunal organisms present. Those within the footprint of the toe berm would be buried. This impact is unavoidable but is considered to be minimal to the area's overall population of intertidal macrofauna.

No Action Alternative. The No Action alternative is not expected to adversely affect any marine or estuarine resources.

5.5 Fisheries and Essential Fish Habitat (EFH).

The 1996 Congressional amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (PL 94-265) set forth new requirements for the National Marine Fisheries Service (NMFS), regional fishery management councils (FMC), and other federal agencies to identify and protect important marine and anadromous fish habitat (those that depend on both freshwater and saltwater). These amendments

established procedures for the identification of EFH and a requirement for interagency coordination to further the conservation of federally managed fisheries.

Wilmington Harbor supports several popular recreational and commercial aquatic species. Some species common to the area include: White shrimp (*Litopenaeus setiferus*), River herring/alewives (*alosa pseudoharengus*), American eel (*Anguilla rostrate*), and migratory fish such as American shad (*Alosa sapidissima*), striped bass (*Morone saxatilis*), and Atlantic and shortnose sturgeon.

Table 1 lists, by life stages, fish and crustacean species which may occur in the vicinity of Wilmington Harbor, and for which Fishery Management Plans (FMPs) have been developed by the South Atlantic Fishery Management Council (SAFMC), Mid-Atlantic Fishery Management Council (MAFMC), and NMFS. These fish species and habitats require special consideration to promote their viability and sustainability.

Table 1. Essential Fish Habitat species in the Wilmington Harbor

Common Name	Scientific Name	Life Stag
INVERTEBRATES		
Brown shrimp	*Farfantepenaeus aztecus*	LJA
White shrimp	*Litopenaeus setiferus*	LJA
Pink shrimp	*Farfantepenaeus*	LJA
COASTAL DEMERSALS		
Red drum	*Sciaenops ocellatus*	ELJA
Bluefish	*Pomatomus saltatrix*	JA
Summer flounder	*Paralichthys dentatus*	LJA
COASTAL PELAGICS		
Spanish mackerel	*Scomberomorus*	JA
King mackerel	*Scomberomorus cavalla*	JA
Cobia	*Rachycentron canadum*	JA
SNAPPERS/GROUPERS		
Black sea bass	*Centropristis striata*	J
Rock sea bass	*Centropristis philadelphica*	J
Gag grouper	*Mycteroperca microlepis*	J
Red grouper	*Epinephelus morio*	J
Black grouper	*Mycteroperca bonaci*	J
Lane snapper	*Lutjanus synagris*	J
Mutton	*Lutjanus analis*	J
snapper Gray	*Lutjanus*	J
Yellow jack	*Carangoides bartholomaei*	J
Blue runner	*Caranx crysos*	J
Crevalle jack	*Caranx hippos*	J
Bar jack	*Caranx ruber*	J
Atlantic spadefish	*Chaetodipterus faber*	J
Sheepshead	*Archosargus probatocephalu*	JA

Common Name	Scientific Name	Life Stag
SHARKS		
Smooth dogfish	*Mustelus canis*	J
SMALL COASTAL SHARKS		
Atlantic sharpnose shark	*Rhizoprionodon*	JA
Finetooth shark	*Carcharhinus isodon*	JA
Blacknose shark	*Carcharhinus acronotus*	JA
Bonnethead shark	*Sphyrna tiburo*	JA
LARGE COASTAL SHARKS		
Silky shark	*Carcharhinus falciformis*	JA
Tiger shark	*Galeocerdo cuvieri*	JA
Blacktip shark	*Carcharhinus limbatus*	JA
Spinner shark	*Carcharhinus brevipinna*	JA
Bull shark	*Carcharhinus leucas*	JA
Lemon shark	*Negaprion brevirostris*	JA
Nurse shark	*Ginglymostoma cirratum*	JA
Scalloped hammerhead	*Sphyrna lewini*	JA
Great hammerhead	*Sphyrna mokarran*	JA
Smooth hammerhead	*Sphyrna zygaena*	JA

Legend: E, Egg; L, Larval; J, Juvenile; A, Adult
Source: Habitat Protection Division, Pivers Island,

Table 2 lists categories of EFH and Habitat Areas of Particular Concern (HAPC) for managed species that were identified in the FMP Amendments affecting the South Atlantic area. HAPC's are subsets of EFH which are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an

environmentally stressed area. No HAPCs are located in the vicinity of Wilmington Harbor. The EFH categories in Wilmington Harbor are indicated by an * in Table 2.

Table 2. Categories of EFH and HAPC identified in FMP Amendments affecting the South Atlantic

EFH	GEOGRAPHICALLY DEFINED HAPC
Estuarine Areas	Area-wide
Estuarine Emergent Wetlands*	Council-designated Artificial Reef
Estuarine Scrub/Shrub Mangroves	Hermatypic (reef-forming) Coral Habitat & Hard Bottoms
Submerged Aquatic Vegetation	Hoyt Hills
Oyster Reefs & Shell Banks*	*Sargassum* Habitat
Intertidal Flats*	State-designated Areas of Importance for Managed Species
Palustrine Emergent & Forested Wetlands	Submerged Aquatic Vegetation (SAV)
Aquatic Beds	
Estuarine Water Column*	
Seagrass	
Creeks	
Mud Bottom	
Marine Areas	North Carolina
Live/Hard Bottoms	Big Rock
Coral and Coral Reefs	Bogue Sound
Artificial/Man-made Reefs	Pamlico Sound at Hatteras/Ocracoke Islands
Sargassum	Capes Fear, Lookout, & Hatteras (sandy
Water Column*	New River
	The Ten Fathom Ledge
	The Point

Dike Raises to 50 Feet. The proposed improvements to Eagle Island CDF resulting in filling approximately 39 acres of *Phragmites*-dominated intertidal marsh will impact the estuarine emergent wetlands EFH. Given the disturbed nature of these wetlands, mitigation provided by the USACE (described in Section 5.16) should offset any adverse environmental impacts of the toe berm construction.

No Action. The No Action alternative would not result in impacts to EFH.

5.6 Terrestrial Resources.

Terrestrial resources found on Eagle Island CDF are the result of frequent and recurring activities including maintenance and raising of dikes as well as the disposal of dredged material.

Dikes are vegetated primarily with various grass species and *Phragmites* and some shrub thickets of wax myrtle (*Myrica cerifera*), silverling (*Baccharis halimiflora*), yaupon (*Ilex vomitoria*), marsh elder (*Iva frutescens*), and Virginia red cedar (*Juniperus virginiana*) are found on the outer portions of the marsh, away from the dikes.
Birds frequenting the Island include marsh hawks (*Falco cyaneus*), kestrels (*Falco sparverius*), bald eagles (*Haliaeetus leucocephalus*), mourning doves (*Zenaida macroura*), fish crows (*Corvus ossifragus*), starlings (*Sturnus vulgaris*), meadowlarks (*Sturnella magna*), boat tailed grackles (*Quiscalus major*), and savannah sparrows (*Passerculus sandwichensis*). Migratory birds include black-necked stilts (*Himantopus mexicanus*), red-winged blackbirds (*Agelaius phoeniceus*), winter sparrows (*Spizella arborea*), common grackles (Q*uiscalus quiscula*), bobolink (*Dolichonyx oryzivorus*), anhinga (*Anhinga anhinga*), painted buntings (*Passerina ciris*), and tree swallows (*Tachycineta bicolor*). A number of species of ducks, wading birds, and other shore birds can be found at various times in the flooded cells and during times of discharge of dredged material.

Gray squirrels (*Sciurus carolinensis*), marsh rabbits (*Sylvilagus palustris*), white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), fox (*Vulpes vulpes*), nutria (*Myocaster coypus*), opossum (*Didelphis virginiana*), coyotes (*Canis latrans*), and bobcats (*Lynx rufus*) are present on or in the vicinity of Eagle Island.

Reptilian and amphibian species observed or likely present on Eagle Island include the southern leopard frog (*Lithobates sphenocephalus*), green tree frog (*Hyla cinerea*), black rat snake (*Pantherophis obsoletus*), eastern cottonmouth (*Agkistrodon piscivorus*), copperhead snake (*Agkistrodon contortrix)*, yellow-bellied slider turtle (*Trachemys scripta scripta*), snapping turtle (*Chelydra serpentina*), and the American alligator (*Alligator mississippiensis*).

Dike Raises to 50 Feet. During construction of the toe berms, temporary adverse impacts will occur to land-based organisms that cannot move or burrow in the ground; however, most will likely vacate the area and return when construction is complete. Following completion of construction, the cells will be periodically filled with dredged material in addition to routine maintenance (mowing, ditching, minor dike repair, travel-way repair, etc). These types of impacts are routine on the Island and have been for approximately the past 50 years. The majority of the terrestrial resources are opportunistic and/or pioneering; therefore, impacts of the proposed project, which are anticipated to be temporary, minimal, and short-lived, will allow for new individuals to utilize the habitat following completion of construction or dredged material disposal events.

No Action. The No Action alternative involves continued use of Eagle Island CDF until no capacity for dredged material remains. Impacts to terrestrial resources will continue as before (periodic filling, ditching, maintenance activities, etc) until the site can no longer be used. Until then, these impacts are ongoing, and the majority of the terrestrial resources in the area have either adapted or moved north of the cells where there is less disturbance.

5.7 Wetlands.
Eagle Island is fringed by marsh/wetlands suited to brackish water. *Phragmites australis* predominates, while cattails (*Typha latifolia*, *T angustifolia*, and *T domingensis*) are interspersed with *Spartina alterniflora* and *patens*, *Typha latifolia*, *Scirpus* spp, *Juncus roermerianus* and various other species of reeds, rushes, and sedges. Areas dominated by *Phragmites* are of lower quality and provide less habitat for native species; however, they are still useful for flood protection, erosion control and improving water quality.

Dike Raises to 50 Feet. In 2010 and again in 2015, the USACE conducted preliminary wetland identification surveys around Eagle Island CDF and determined that there is extensive coastal marsh fringing the Island. The proposed toe berm construction will fill approximately 39 acres of intertidal marsh vegetated almost exclusively with *Phragmites*. Construction of the dike raises and toe berms will require mitigation to offset the loss of 39 acres of *Phragmites*-dominated intertidal marsh. Refer to section 5.16 for details.

No Action. The No Action alternative would continue utilizing existing methodologies of Eagle Island disposal. Each maintenance dredging contract is conditioned to require avoidance of impacts to all wetlands unless first coordinated with and authorized by appropriate state and federal resource agencies. Therefore, no adverse impacts to wetlands would occur unless prior project-specific coordination has been completed.

5.8 Floodplains.
A floodplain is an area of land adjacent to a body of water that is inundated during flood events. The 100-year flood is a flood event that has a 1% probability of occurring in any given year. 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.

Adverse impacts to floodplains occur when an activity removes an area that flood waters could otherwise occupy, thereby raising the elevation of flood waters and possibly increasing flooding at another location.

Dike Raises to 50 Feet. The proposed project involves the construction of a toe berm with a footprint of approximately 80 acres. Approximately 39 acres of this impact is located in intertidal marsh around the base of Eagle Island CDF. While this impact is unavoidable, it may adversely impact the floodplain by slightly increasing the chance or severity of flooding at nearby locations. Looking at a cross-sectional image of the river where it intersects with the widest portion of the toe berm (on the southwest side of Cell 1 adjacent to the Brunswick River), would give an approximate idea of volumes of material displacing tidal marsh and the affect it would have on the river system in the event of a flood. Given the size of the Cape Fear, Northeast Cape Fear, and Brunswick Rivers, and the acreage of tidal wetlands in the project area, this impact is negligible.

No Action. Under No Action, the Eagle Island dikes would not be expanded beyond 42 foot elevation; therefore, toe berms would not be required and no changes to the floodplain would occur.

5.9 Endangered and Threatened 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. In accordance with section 7 (a)(2) of the ESA, the USACE is initiating consultation with the US Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (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.

Updated lists of endangered and threatened species for the project area were obtained from NMFS (Southeast Regional Office, St. Petersburg, FL) and the USFWS (Field Office, Raleigh, NC). These were combined to develop the composite list shown in Table 3, which 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.

For the upper Wilmington Harbor portion of the Cape Fear River, the only species that may occur in the project area are two endangered sturgeon species: shortnose (*Acipenser brevirostrum*) and Atlantic (*Acipenser oxyrinchus oxyrinchus*). Whales, manatee, and sea turtles species are not likely to occur in the project area or be affected by the proposed project. Furthermore, the Eagle Island CDF does not provide habitat for any of the listed bird species in the area: piping plovers and red knots prefer oceanfront beaches; red cockaded woodpeckers are accustomed to long leaf forests; and the wood stork favors cypress trees and mangrove swamps.

Table 3. Endangered and Threatened Species Potentially Impacted by the Proposed Eagle Island Improvement Project (Brunswick and New Hanover Counties)

Species Common Names	Scientific Name	Federal Status
MAMMALS		
Blue whale	(*Balaenoptera musculus*)	Endangered
Finback whale	(*Balaenoptera physalus*)	Endangered
Humpback whale	(*Megaptera novaeangliae*)	Endangered
Right whale	(*Eubaleana glacialis*)	Endangered
Sei whale	(*Balaenoptera borealis*)	Endangered
Sperm whale	(*Physeter macrocephalus*)	Endangered
W Indian manatee	(*Trichechus manatus*)	Endangered
BIRDS		
Piping plover	(*Charadrius melodus*)	Threatened
Red cockaded woodpecker	(*Picoides borealis*)	Endangered
Red knot	(*Calidris canutus rufa*)	Threatened
Wood stork	(*Mycteria Americana*)	Threatened

REPTILES		
Green sea turtle	(*Chelonia mydas*)	Threatened[1]
Hawksbill sea turtle	(*Eretmochelys imbricata*)	Endangered
Kemp's ridley sea turtle	(*Lepidochelys kempii*)	Endangered
Leatherback sea turtle	(*Dermochelys coriacea*)	Endangered
Loggerhead sea turtle	(*Caretta caretta*)	Threatened
FISHES		
Atlantic sturgeon	(*Acipenser oxyrinchus oxyrinchus*)	Endangered
Shortnose sturgeon	(*Acipenser brevirostrum*)	Endangered

[1]Green turtles are listed as threatened, except for breeding populations in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

5.9.1 Status, Distribution, and Habitat

Shortnose Sturgeon

The shortnose sturgeon (*Acipenser brevirostrum*) inhabits large Atlantic coast rivers from New Brunswick, Canada south to northeastern Florida. Adults in southern rivers are estuarine anadromous, foraging at the freshwater-saltwater interface and moving upstream to spawn in the early spring. Although the shortnose sturgeon is anadromous, they spend most of their life in their natal river systems and rarely migrate to marine environments. Spawning habitats include river channels with gravel, gravel/boulder, rubble/boulder, and gravel/sand/log substrates. Spawning in southern rivers begins in later winter or early spring and lasts from a few days to several weeks. Juveniles occupy the freshwater-saltwater interface, moving back and forth with the low salinity portion of the salt wedge during summer. Juveniles typically move upstream during the spring and summer and downstream during the winter, with movements occurring above the freshwater-saltwater interface. In southern rivers, both adults and juveniles are known to congregate in cool, deep thermal refugia during the summer. The shortnose sturgeon is a benthic omnivore, feeding on crustaceans, insect larvae, worms, and mollusks. Juveniles randomly vacuum the bottom and consume mostly insect larvae and small crustaceans. Adults are more selective feeders, feeding primarily on small mollusks (NMFS 1998).

Atlantic Sturgeon

The Atlantic sturgeon (*A. oxyrinchus oxyrinchus*) was listed under the ESA on 6 February 2012 (77 FR 5914, 77 FR 5880). The spawning population in the Cape Fear River system is thought to number less than 300 adults [Atlantic Sturgeon Status Review Team (ASSRT) 2007]. 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 (Smith and Clugston 1997). Spawning is believed to occur in flowing water between the salt front and fall line of large rivers. Post-larval juveniles move downstream into brackish waters and eventually move to estuarine waters where they reside for a period of months or years (Moser and Ross 1995). Subadult and adult Atlantic sturgeons emigrate from rivers into coastal waters where they may undertake

long range migrations. Migratory subadult and adult sturgeon are typically found in shallow (10 to 50 m) nearshore waters with gravel and sand substrates (Collins and Smith 1997, Stein et al. 2004). Although extensive mixing occurs in coastal waters, Atlantic sturgeons return to their natal river to spawn (ASSRT 2007).

5.9.2 Occurrence in the Action Area

Shortnose Sturgeon
The shortnose sturgeon was thought to be extirpated from NC waters until an individual was captured in the Brunswick River in 1987 (Ross et al. 1988). Subsequent gill-net studies (1989-1993) resulted in the capture of five shortnose sturgeon, thus confirming the presence of a small population in the lower Cape Fear River (Moser and Ross 1995). The current distribution of the shortnose sturgeon in NC is thought to include only the Cape Fear and Pee Dee Rivers, and no reproducing populations have been documented in the state [Shortnose Sturgeon Status Review Team (SSSRT) 2010].

Atlantic Sturgeon
The Atlantic sturgeon occurs in the Cape Fear River system adjacent to the action area. Based on incidental capture data from tagging cruises, shallow nearshore ocean waters along the NC coast may represent a winter (January-February) aggregation site for Atlantic sturgeon (Laney et al. 2007). Incidental captures typically occurred over sand substrate in nearshore waters that were less than 59 feet deep.

5.9.3 Threats
Potential effects include direct impacts on benthic habitats and food resources, hydrological modifications, turbidity and siltation, and hopper dredge entrainment.

5.9.4 Project Effects
Toe berm construction would not have a direct impact, but can potentially impact Atlantic and shortnose sturgeons indirectly through sediment suspension and soft bottom habitat modification. The shortnose sturgeon is typically found in the upper portions of rivers above the freshwater-saltwater interface; based on its low probability of occurrence in the action area, impacts on shortnose sturgeon would not be expected under the proposed action.

Two incidental takes of Atlantic sturgeon occurred at Wilmington Harbor: including one in the upper Cape Fear River near the State Port in 1998, and one in the lower river near Horseshoe Shoals in 2010, both by hopper dredge entrainment. The potential for impacts related to discharge of material in lowland marsh would be minimal. Based on this, it is anticipated that the risks to Atlantic sturgeon during toe berm construction would be very low.

5.9.5 Determination of Effect

Dike Raises to 50 Feet. Based on its low probability of occurrence in the action area, it is determined that the proposed action may affect, but is not likely to adversely affect, the shortnose sturgeon.

Although there is no critical habitat designated for the Atlantic sturgeon, it has been documented to occur in the Cape Fear and Northeast Cape Fear Rivers, indicating that it is present within the action area. Considering the impacts associated with the proposed project involve a discharge of fill material into tidal, brackish marsh, it is determined that the proposed action may affect, but is not likely to adversely affect, the Atlantic sturgeon.

The proposed toe berm construction would not affect any other federally listed species.

No Action. The No Action alternative would result in no adverse impacts to threatened or endangered species.

5.10 Cultural Resources.

The Cape Fear River has a long and active history as one of the earliest and most significant waterways in North Carolina. Spanish explorers sighted the river in the early 16th century and European settlement began in 1664 with the establishment of Charles Town near the mouth of Town Creek. By 1733, the town of New Carthage, later renamed Wilmington, had been laid out, and became the main cultural and maritime center. During the years leading up to the Revolution, numerous confrontations took place between the American patriots and British loyalists and troops, and Wilmington itself became occupied by the British in October of 1781.

During the 19th century, up to 40 ships per month were visiting Wilmington's harbor, and by the mid-19th century there were over 140 named landings located along the 115 miles of river between Wilmington and Fayetteville. The importance of Wilmington to the Confederacy is reflected in the fortifications used to protect the city and her approaches. Fort Fisher, Fort Holmes, Zekes Island Battery, Camp Wyatt, Fort Hendrick, Fort Campbell, Fort Johnston, Fort Caswell, Battery Buchanan, Fort Anderson, Shaw Battery, Mound Battery, and Battery Lamb were located on the Cape Fear River at and below Wilmington, or faced the ocean and river in Brunswick County, and all were important elements in the coastal defenses. The defenses at Wilmington were not defeated until late in the war when Fort Fisher finally fell in 1865; Wilmington was occupied by Union troops soon afterward.

After the Civil War, Wilmington's major water courses began to reflect the transition from plantation and agrarian economies to the commercial agriculture and industrial enterprises that would dominate throughout the 20th century. By 1905, channel improvements made the Northeast Cape Fear River navigable for pole boats all the way to Kornegays Bridge, 103 miles above the river's mouth, and ship building, fertilizer and brick factories, shipping terminals, and other capital intensive industries began to replace commercial fishing, hunting, forestry, and agriculture as the economically dominant businesses.

In the early days of World War II, the North Carolina Shipbuilding Company began building Liberty ships in shipyards along the east bank of the Cape Fear River just south of Eagle Island. By 1946 the company built 243 ships in all. By 1949, when the war was over, the returned ships were stationed in the Brunswick River. A total of 648 ships were, at varying times, moored in the reserve fleet, known as the “Mothball Fleet”. Over the years many were scrapped, sold to private concerns, sunk for artificial reefs, or recommissioned. The last ship to be removed from the “graveyard” was the Liberty Ship "USS Dwight W. Morrow", which was scrapped in February 1970 (Memorieshop, 2013).

Archaeologically, the importance of the area as a maritime center is shown by the large number of shipwrecks and abandoned shipyards. Thirty-seven historic shipwrecks are listed on the 1985 National Register of Historic Places Registration addendum for the Wilmington Historic District prepared by the North Carolina Division of Archives and History (NCDAH). In addition, over 130 shipwrecks are known from the lower Cape Fear to the Northeast Cape Fear River vicinity, as well as historic remains of numerous shipyards, Liberty Ships, marine railways, and dry docks.

Dike Raises to 50 Feet. No known adverse impacts to cultural or archaeological resources would occur as a result of the toe berm construction. No previously identified shipwrecks or other culturally significant remains are within the proposed project footprint. It is always possible during the course of a project that vessel remains or other cultural resources could be encountered. All USACE construction contracts would require that contractors and others involved in the project be aware that the possibility exists that work may encounter cultural materials. In the event that this occurs, work would be required to move to another area and the USACE and the NCDCR Underwater Archaeology Unit (telephone number 910-458-9042) would be contacted immediately to determine a course of action.

No Action. The No Action alternative would have no change to the existing footprint of the project and therefore result in no adverse impacts to cultural or archaeological resources.

5.11 Aesthetic and Recreational Resources.

While the Cape Fear River is, overall, a scenic setting, Eagle Island CDF is a man-made feature whose purpose is to receive dredged material. A substantial portion of Eagle Island CDF is located across the River from the NC State Ports facility, so commercial shipping, channel maintenance, marine construction, and other activities not commonly associated with what many consider to be aesthetically pleasing vistas frequently occur.

Eagle Island CDF is considered an active construction site, so for safety and security reasons, unauthorized persons are not allowed on the premises. Therefore, recreational activities, aside from bird watching from afar, are not permitted.

Dike Raises to 50 Feet. Construction of the preferred alternative would result in an increase of construction-related equipment and impacts. However, such activity is not

uncommon to the area. Raising the dikes to 50 feet would block the viewshed of approximately 15 homeowners on the Brunswick River looking east, since they would no longer be able to see beyond Eagle Island to the NC State Ports facility, marine terminals and other industrial sites. However, most of this view beyond Eagle Island is already blocked by the existing dikes.

The proposed work would be located adjacent to areas frequented by boat traffic and fishermen. Aesthetics and public use of the areas may occasionally be disrupted while construction is occurring, which could take up to 5 - 10 years to complete. Based on past experience with similar projects, such impacts are minimal and do not create hardships for the public. Following completion of the dredging, aesthetics and recreational opportunities would be only slightly changed from conditions existing prior to undertaking the project.

No Action. The No Action alternative would result in no additional adverse impacts to aesthetics or recreation than already exist.

5.12 Socio-Economic Resources.

Demographic Profiles

New Hanover and Brunswick Counties are located at the Southeastern portion of the state of North Carolina. The counties include 192 and 847 square miles respectively in land and water area. Table 4 provides population data for the United States, North Carolina, New Hanover and Brunswick Counties over the last 20 years for which data is available.

Table 4. New Hanover and Brunswick Counties Statistical Area - Total Population Data

Area	% Change '90 - '12	2012	2000	1990
United States	25.76%	313,914,040	282,162,400	249,622,800
North Carolina	46.34%	9,752,073	8,081,600	6,664,000
New Hanover	72.72%	209,234	160,842	121,140
Brunswick County	118.95%	112,257	73,756	51,271

*population estimates provided by U.S. Census

An estimated 321,000 residents lived in New Hanover and Brunswick Counties in 2012. This represents a population increase of 35 percent since 2000 and an increase of 86 percent since 1990.

The residents of New Hanover and Brunswick Counties contain a mix of races and ethnicities. Based on 2012 census figures, 79.1 percent of New Hanover County residents are white, 15.0 percent are black, 5.3 percent are Hispanic, 1.2 percent Asian, and 0.6 percent identified as Native American. The census of Brunswick County estimates that 85.4 percent of its residents are white,

11.6 percent are black, 5.1 percent are Hispanic, 0.6 percent Asian, and 0.8 percent identified as Native American.

In the state of North Carolina, 72.1 percent of the population is white, 22.0 percent of the population is black, 8.6 percent Hispanic, 2.3 percent are Asian, and 1.5 percent are Native American. Table 6 displays racial demographics for the Nation, State, New Hanover and Brunswick Counties.

Table 5. Population by Race

	New Hanover County	Brunswick County	North Carolina	United States
Population, 2012	206,189	112,257	9,752,073	313,914,040
White persons, percent	79.1%	85.4%	72.10%	78.1%
Black persons, percent	14.8%	11.6%	22.0%	13.1%
Hispanic	5.3%	5.1%	8.6%	16.7%
Asian persons, percent	1.2%	0.6%	2.3%	5.0%
Native (American Indian, Alaska Native, Hawaiian, etc)	0.6%	0.8%	1.5%	1.2%
Two or More Races	2.0%	1.5%	1.9%	2.3%

*population estimates provided by U.S. Census

Approximately 48 percent of the population for New Hanover County was sixteen years and over, with 53.2 percent of the population in the labor force. The unemployment rate for the County is 10.4 percent. A total of 37.2 percent of Brunswick County's population is sixteen or over, with 45.5 percent of the population in the labor force, and unemployment rate of 11.0 percent. The unemployment rates for North Carolina and the United states were 10.6 and 9.3 percent respectively.

Table 6. Civilian Labor Force by Occupation

	New Hanover County	Brunswick County	North Carolina	United States
Civilian employed population 16 years and over	98,896	41,791	4,128,576	139,033,928
OCCUPATION				
Agriculture Forestry, Fishing, Hunting, Mining	0.18%	0.66%	1.37%	1.90%
Construction	6.89%	12.89%	6.85%	6.25%
Manufacturing	6.28%	6.94%	12.41%	10.39%
Wholesale Trade	3.10%	1.78%	3.03%	2.83%
Retail Trade	12.54%	16.60%	11.99%	11.65%
Transportation, Warehousing,	3.80%	5.02%	4.25%	4.92%
Information	3.15%	1.78%	1.69%	2.17%
Finance, Insurance, Real Estate, Rental, Leasing	5.43%	7.44%	6.35%	6.67%
Professional, Scientific, Management, Administrative, Waste Management Services	10.84%	9.03%	9.51%	10.58%
Educational Services, Healthcare, Social	25.15%	18.25%	23.41%	23.24%
Arts, Entertainment, Recreation, Accommodation, Food Services	13.54%	10.94%	9.25%	9.25%
Public Administration	3.28%	4.41%	4.86%	5.17%
Other Services, Except Public	5.83%	4.26%	5.04%	4.97%

In 2010, the median household income of Brunswick County was $45,806. This is higher than the State's average of $43,326, but lower than the national average of $50,046. The mean household income was $57,088. The median household income of New Hanover County was $46,130 and the mean household income was $63,093. Table 7 shows the number of households in the New Hanover and Brunswick Counties, North Carolina, and the United States by the percentage of their respective incomes.

Table 7. Number of households and the percentage of their respective incomes

Total	New Hanover County	Brunswick County	North Carolina	United States
Less than $10,000	10.47%	7.64%	8.97%	7.64%
$10,000 to $14,999	9.98%	17.45%	13.01%	11.46%
$15,000 to $24,999	12.07%	10.86%	12.47%	11.17%
$25,000 to $34,999	10.85%	8.82%	11.59%	10.41%
$35,000 to $49,999	9.90%	11.76%	10.20%	9.27%
$50,000 to $74,999	17.91%	19.15%	18.39%	18.28%
$75,000 to $99,999	11.35%	11.36%	10.79%	11.81%
$100,000 to $149,999	11.15%	8.62%	9.05%	11.82%
$150,000 to $199,999	3.12%	2.04%	2.88%	4.20%
$200,000 or	3.21%	2.30%	2.66%	3.94%

Source: http://www.usa.com/brunswick-county-nc.htm
http://www.usa.com/new-hanover-county-nc.htm

Economic Characteristics of Wilmington Harbor

Navigation

A thorough analysis of the existing fleet data for vessels calling at Wilmington Harbor in 2009 revealed six typical vessel types: (1) Containerships, (2) Bulk Carriers, (3) General Cargo Vessels, (4) Petroleum Tankers (5) Chemical Tankers, and (6) Ro-Ro Vessels (includes Vehicle Carriers).

Containerships made up nearly 35% of the deep-draft vessels calls at Wilmington Harbor in 2009. The largest vessels that call at Wilmington Harbor at the present time are containerships of 62,000 to 65,000 deadweight tons (DWT). They are between 950 and 965 feet long, 106 feet in beam, and have design drafts of between 42 and 44 feet. Their actual sailing drafts were 38 feet or less when calling at Wilmington Harbor in 2009. Containerships maintain an under keel clearance of at least 10 percent of sailing draft in the channel at all times. They can carry up 4,400 to 4,800 Twenty Foot Equivalent Units (TEUs); however, they generally transfer less than 1,500 TEUs at the port, which are split between imports and exports. These larger ships typically travel between the Far East and East Coast of the US.

Additional Container subclasses that call in Wilmington include smaller vessels in the

50,000 DWT class. These are generally about 850 feet long, have design drafts of about 41-42 feet, and can carry up to about 4,000 TEU's. An even smaller sub-class of container vessel typically service Europe and Central/South America. These vessels are generally between 20,000 DWT and 22,000 DWT. They are typically 525 to 550 feet in length, with beams ranging from 82 to 93 feet, and design drafts between 32 and 35 feet. They can carry up to approximately 1,300 TEUs.

The largest Bulk Carriers were rated at about 55,000 DWT with a length of 656 feet, a beam of 106 feet, and a design draft of 38 feet. The largest General Cargo vessels were rated at about 47,000 DWT with a length of 656, a beam of 102 feet and a design draft of 40.4 feet.

The largest non-container vessels that call at the port are Oil Tankers. These vessels are range in size from 70,000 DWT to 76,000 DWT, a length of 700 to 750 feet, with beams of 106 to 131 feet, and design drafts ranging from 40 to 46 feet. The actual sailing drafts of these vessels in Wilmington Harbor were 38 feet or less in 2009.

Hinterland

The Port of Wilmington's hinterland is primarily within the state of North Carolina. It includes Raleigh, Durham, Greensboro, Fayetteville, and the Wilmington area. The port is connected to the Raleigh-Durham area by Interstate I-40 and to Greensboro by Interstate I-73. The primary Port facilities are approximately 75 miles from Interstate I-95 and 200 miles from Interstate I-85, which are the primary north / south transportation corridors through North Carolina. These highways connect the Port of Wilmington to Charlotte, Greensboro, and Raleigh/Durham. Improvements to Interstate I-74 have added vehicle capacity between the port and I-85, which connects to Charlotte, North Carolina.

Landside transportation to and from the Port of Wilmington is primarily by truck. Trucks must pass through residential areas to reach the interstates. They must traverse Burnett Boulevard (two-lane road) to reach I-74, or Shipyard Boulevard and College Road (four lane bi-directional roads) with a series of stop lights to reach I-40. CSX provides daily rail service to the port through one line connecting to the main line at Hamlet. The rail route is through the City of Wilmington and crosses many of the city's major roads. Most crossings within the city are "at-grade."

Port Facilities

Wilmington Harbor has a variety of marine facilities located on both the left and right banks of the Cape Fear River between river miles 26 and 31. The marine facilities listed below, beginning with the terminal located furthest upstream, include: Kinder Morgan, Colonial Oil, Amerada Hess, Vopak, North Carolina State Port Authority berths one through nine, Apex Oil, the Invista Terminal, Carolina Marine Terminal, South Wilmington Terminal, National Gypsum Terminal, and Sunny Point, also known as the Military Ocean Terminal and Archers Daniels Midland.

Economic Impact of Proposed Action

Eagle Island is the least cost disposal option for dredged material from the upper reaches of the Wilmington Harbor project. It is important that the NC State Ports have feasible disposal options in order to keep costs of maintaining the harbor down, which helps keep the costs of goods in the Wilmington area affordable to the public. The Anchorage Basin reach of the project requires maintenance every year, and costs roughly $1.2 million per dredge cycle (with disposal in Eagle Island). The National ranking of State Ports determines the priority of funding from the Federal Government. An increase in costs of dredging (transporting material to the ODMDS in lieu of Eagle Island) would likely impact the Port of Wilmington's relative ranking, thus having the potential to impact annual funding.

Dike Raises to 50 Feet. Increasing the dredged material capacity of Cells 1-3 will provide a feasible disposal site for Wilmington Harbor maintenance contracts for the next 16 years. It is important to continue using Eagle Island as a disposal facility as long as possible, as its access and proximity make it the least cost option.

No Action. Without raising dike elevations beyond 42 feet, once Cells 1-3 reach capacity there will be no other feasible alternative than to dispose of dredged material in the ODMDS. The costs associated with transporting material approximately 70 miles round trip would inevitably increase the costs to maintain the upper reach of the Wilmington Harbor. If USACE contracts for maintenance become too costly to be awarded, dredging will happen less frequently, which would affect the draft of ships that can access the Port. Ultimately, this could raise the cost of goods and have a widespread effect on the regional economy.

5.13 Hazardous, Toxic, and Radioactive Waste.

The United States Environmental Protection Agency's (EPA) Envirofacts website was queried to identify the presence of EPA-regulated facilities within three miles of the proposed project area. The Envirofacts website contains information collected from regulatory programs and other data relating to environmental activities with the potential to affect air, water, and land resources in surrounding areas. One site was reported within a three mile radius, and was identified as the WWTP immediately adjacent to the proposed project area (U.S. Environmental Protection Agency 2015).

Multiple on-site inspections of the project area and surroundings have been performed by USACE, Wilmington District staff. Based on the site visit on March 18, 2015 and an investigation of historic aerial photographs, no evidence of improperly-managed hazardous and/or toxic materials or indicators of those materials were present in the proposed project area. USACE construction specifications require contractors to clean and remove all contaminants.

Dike Raises to 50 Feet. The recommended plan would not impact hazardous and toxic materials in the proposed project area, nor would it produce hazardous and toxic materials.

No Action. The No Action alternative may not directly result in any impacts to or produce any hazardous and toxic materials.

5.14 Noise.

In the proposed project area vicinity, noise levels are typically dependent on activity occurring at the State Ports or on Eagle Island itself. The cells are in a constant state of maintenance, as they are ditched and drained on a rotating basis and material is used to raise the dikes. Large excavators, backhoes, dump trucks, utility trucks, and pumps are commonly found working on Eagle Island. Noise levels are elevated during construction activities, as expected within commercial/industrial areas.

According to Section 6-28 of the City of Wilmington Noise Ordinance Code: a sound or noise shall be deemed a noise disturbance if, when measured as prescribed herein, it exceeds the levels set forth below:

Commercial/industrial area: 75 decibels (daytime level) between the hours of 7:00 a.m. and 10:00 p.m., or 70 decibels (nighttime level) between the hours of 10:00 p.m. and 7:00 a.m. On Friday and Saturday, the daytime level shall remain in effect until 12:00 midnight.

Similarly, in accordance with Section 23-33 of the New Hanover County code of ordinances, it would be unlawful for sounds to exceed 75 decibels during the day and 70 decibels at night in non-residentially zoned districts.

Dike Raises to 50 Feet. Construction activity associated with the recommended plan is expected to comply with Section 6-28 and Section 22-33, NC code of ordinances.

No Action. The No Action alternative would comply with all published noise ordinances as well.

5.15 Environmental Impact Comparison of Alternatives.

The table below provides a brief summary and comparison of impacts to the physical and natural environment for the alternatives considered.

Table 8. Comparison of Impacts to Resources

Resource	Alternatives	
	Proposed Action (Dike Raises to 50 Ft)	**No Action**
Geology and Sediments	Disposal practices will continue as normal and dredged material composition is not expected to change. No adverse impacts.	No Impacts/status quo.
Water Resources	Impacts would be temporary due to minor increases in turbidity during construction; no adverse impacts expected.	No Impacts/status quo.
Air Quality	Temporary impacts during construction due to increases in emissions from heavy equipment. No adverse impacts expected.	Potential increase in fuel consumption emissions due to round trip travel to/from the ODMDS. No adverse impacts expected.
Aquatic Resources	No adverse impacts expected as life forms are anticipated to move and avoid areas	No impacts/status quo.

	during construction (though some mortality is inevitable).	
Essential Fish Habitat	Permanent impacts to estuarine emergent wetlands EFH due to filling of 39 acres of *Phrag* marsh. No adverse impacts expected.	No impacts/status quo.
Terrestrial Resources	Temporary adverse impacts will occur to organisms during construction however most will vacate the area. Potential benefits to terrestrial resources in the long-term.	No impacts/status quo.
Wetlands	Permanent impacts to 39 acres of *Phrag* marsh. Mitigation proposed to purchase 3.04 credits of coastal marsh habitat.	No impacts/status quo.
Floodplains	Placement of 39 acres of fill within coastal wetlands of CFR floodplain. No adverse impacts to floodplains expected.	No impacts/status quo.
E & T Species in Project Area	Potential indirect impacts through sediment suspension and soft bottom habitat modification. No adverse impacts to Atlantic or shortnose sturgeon expected.	No impacts to Atlantic or shortnose sturgeon expected.
Cultural Resources	No known cultural resources present; no adverse impacts expected.	No impacts/status quo.
Aesthetic and Recreational Resources	Temporary impacts expected during construction, however no adverse impacts expected.	No impacts/status quo.
Socio-economic Resources	Status quo (maintain access of ships to Wilmington Harbor Port).	Negative impacts to local economy.
Hazardous Waste	No impacts.	No impacts.
Noise	Minor increases in noise during construction. Impacts temporary and not adverse.	No impacts/status quo.

5.16 Mitigation.

The USACE has conducted several coordination meetings with state and federal resource agencies regarding appropriate mitigation to offset the impacts of the proposed fill. The 39 acres of impact are to *Phragmites*-dominated coastal marsh. *Phragmites* are a non-native aggressive wetland plant that outcompetes native *spartina alterniflora* and *patens typha* and *juncus*. As a monoculture, they provide little habitat and food source for native species. Because of the lessened adverse environmental impact of filling *Phragmites*-dominated marsh, the USACE has determined that a set ratio (acre for acre or portion of an acre) of wetland mitigation is not necessary to offset the impacts of the proposed project.

The USACE has coordinated with NC Division of Mitigation Services (DMS) to determine the availability of compensatory mitigation through the “In-Lieu-Fee Program”. Through this process, the USACE would purchase credits from the DMS to offset the loss of wetland function and value of the 39 acres of impacts. After speaking

with a DMS representative, it was determined that 3.04 acres of coastal marsh “credits” are available for purchase. However, this is associated with a coastal marsh restoration site in Jacksonville, Onslow County known as Wilson Bay (Sturgeon City) Phase I, which has been established since 2007 when it was released from monitoring. The USACE has determined that the 3.04 acres of high quality restoration area would mitigate for the loss of *Phragmites* wetlands adjacent to Eagle Island, even though it is located in a different HUC (White Oak, 03030001).

The 2006 final monitoring report identified the primary goals achieved from the Wilson Bay restoration project:

1. Reduction of nutrient and stormwater inputs to adjacent estuarine waters.
2. Stabilization of the shoreline through restoration of native vegetation.
3. Improved aesthetics to that of a natural estuarine marsh.
4. Enhancement of wildlife habitat.

The area of brackish marsh restoration included plantings of *Spartina cynosuroides* in the lower elevations and *Spartina patens* in the higher elevations. These habitats support nekton, benthos, and macrofauna that would otherwise replace the loss of species in the 39 acres of degraded habitat. In addition, they provide a food source for fish, birds, and other animals residing in or traveling through the area.

5.17 Cumulative Impacts.

The Federal Executive Branch’s Council on Environmental Quality defines cumulative impact as “the impact on the environment [that] results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7, National Environmental Policy Act of 1969, as amended).

Cumulative impacts of implementing the no action alternative, over time, would have the potential to cause significant adverse impacts to the local economy. Additionally, not increasing the capacity of Eagle Island CDF would possibly increase levels of water and air pollution due to the increased barge traffic to unload material to the ODMDS.

Eagle Island, originally composed of natural uplands, coastal marsh, and tidal creeks, was used as a disposal area even before the USACE began disposing of dredged material from the river in the early 1900s. On average, approximately 1.3 million cubic yards of material are dredged from the Anchorage Basin portion of the river and deposited in Eagle Island CDF annually. The deepening of the river in 2002-2003 resulted in an additional 1.75 million, and again in 2012-2013 with approximately 800,000 CYs that was placed in Cell 2.

The NC State Ports Authority (NCSPA) also utilizes Eagle Island CDF for the material dredged from their berths (1-9) and the new turning basin extension. These areas are critical to ships turning and docking at the ports and require maintenance annually. The new Panamax ships that outsize the existing cargo vessels that frequent the Wilmington Harbor will soon be calling, and additional deepening and widening of the Anchorage

Basin expansion will be required to accommodate them as well. This additional material will also need an approved disposal location.

A good percentage of the banks of the Cape Fear and Brunswick Rivers are undeveloped and contain low-lying coastal marsh and wetlands. This pervious natural floodplain is essential for allowing flood waters to flow over and slowly drain as sea levels recede after a storm. The filling and heightening of the toe berms and dikes on Eagle Island CDF will take away approximately 39 acres from this natural floodplain, but that is nominal in comparison to what remains.

It is reasonably foreseeable that dredging of the past projects and on-going maintenance of the Federal project would be expected to continue. The use of the area for commercial and recreational navigation is expected to continue and increase as the mariner population in the area continues to grow. New marinas currently under construction include the 200-slip Port City Marina on the upper Wilmington Harbor portion of the Cape Fear River, and the 64-slip Hawkeswater Marina on the Brunswick River.

Also increasing is the size and number of ships calling to port in the Wilmington Harbor. In response to the widening of the Panama Canal, the Port of Wilmington requested and received permits to widen the turning basin at the Vopak terminal just north of the Ports. Dredging an additional width of 200 feet to a depth of -42 +2 feet will occur during June 2016, and material will be disposed of in Cell 1 of Eagle Island. The NCSPA was required to provide compensatory mitigation for this action since the dredging will occur within Primary Nursery Area. Mitigation includes the preservation of 13.4 acres of coastal marsh property owned by NCSPA on the Brunswick River, located directly across from the cross-dike between Cells 2 and 3.

The preferred alternative, in conjunction with any past, present, or reasonably foreseeable future projects, is not expected to have any significant adverse cumulative impacts to the environment. Future dredging actions in the project area and the above-mentioned reasonably foreseeable future projects would be subject to regulatory requirements and federal actions would be evaluated in accordance with NEPA. The proposed action is expected to have minimal impact on overall functionality and quality of coastal riparian vegetation and available wildlife habitat in the proposed project area.

The components of the proposed action are expected to cause only very minor effects. The proposed action will:
• not significantly impact water quality,
• not significantly impact marine or estuarine life,
• not significantly impact cultural resources, and
• not cause significant adverse impacts for any other aspects of the environment.

Cumulative impacts of the proposed action appear negligible. Furthermore, increased capacity of Eagle Island CDF will have a long term positive impact on the local economy.

5.18 Public Laws and Executive Orders.

Table 9 lists the compliance status of all executive orders considered for the proposed Eagle Island CDF improvement project. Further descriptions of proposed project compliance with executive orders are below.

Table 9. Compliance of the proposed action with executive orders.

Executive Orders	Number	Compliance Status
Protection and Enhancement of Environmental Quality	11514	Full*
Protection and Enhancement of the Cultural Environment	11593	Full*
Floodplain Management	11988	Full*
Protection of Wetlands	11990	Full*
Federal Compliance with Pollution Control Standards	12088	Full*
Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	12898	Full*
Protection Of Children from Environmental Health Risks and Safety Risks	13045	Full*
Invasive Species	13112	Full*
Protection of Migratory Birds	13186	Full*

** - Compliance Status shall be considered 'Full Compliance' following completion of the NEPA process.*

5.18.1 Protection and Enhancement of Environmental Quality

The Federal Government shall provide leadership in protecting and enhancing the quality of the Nation's environment to sustain and enrich human life. Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals.

The preferred alternative will not violate any provisions relating to the protection and enhancement of environmental quality, and will be in full compliance with Executive Order 11514 following completion of the NEPA process.

5.18.2 Protection and Enhancement of the Cultural Environment

The Federal Government shall provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the Nation. Federal agencies will administer the cultural properties under their control in a spirit of stewardship and trusteeship for future generations. Federal agencies will initiate measures necessary to direct their policies, plans, and programs in such a way that federally owned sites, structures, and objects of historical, architectural or archaeological significance are preserved, restored, and maintained for the inspiration and benefit of the people. In consultation with the Advisory Council on Historic Preservation (16 U.S.C. 470i), federal agencies will institute procedures to assure that federal plans and programs contribute to the preservation and enhancement of non-federally owned sites, structures, and objects of historical, architectural or archaeological significance.

The preferred alternative will not adversely affect cultural resources and will be in full compliance with Executive Order 11593 following completion of the NEPA process.

5.18.3 Floodplain Management

In order to avoid, to the extent possible, the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative, federal agencies shall take action to reduce the risk of flood loss and minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

The preferred alternative would not adversely affect floodplains or alter their function, and will be in full compliance with Executive Order 11988 following completion of the NEPA process.

5.18.4 Protection of Wetlands

In order to avoid, to the extent possible, the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands, wherever there is a practicable alternative, federal agencies will take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities.

The preferred alternative will alter the function of 39 acres of low quality, *Phragmites*-dominated coastal marsh. However, loss of function will be mitigated for through purchase of ~3 acres of restored coastal marsh in the upper portion of the New River, and will be in full compliance with Executive Order 11990 following completion of the NEPA process.

5.18.5 Pollution Control Standards

Federal agencies are responsible for ensuring that all necessary actions are taken for the prevention, control, and abatement of environmental pollution with respect to federal facilities and activities under the control of the agency.

The preferred alternative will not violate applicable pollution control standards and will be in full compliance with Executive Order 12088 following completion of the NEPA process.

5.18.6 Environmental Justice in Minority and Low-Income Populations

Environmental justice is defined as the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA further defines fair treatment to mean that no group of people should bear a disproportionate share of the negative environmental consequences of industrial, governmental, or commercial operations or policies.

The preferred alternative will not have the potential for disproportionate health or environmental effects on minorities or low-income populations or communities, and will

be in full compliance with Executive Order 12898 following completion of the NEPA process.

5.18.7 Protection of Children from Environmental Health Risks and Safety Risks

Federal agencies identify and assess environmental health and safety risks that may disproportionately affect children as a result of the implementation of federal policies, programs, activities, and standards.

The preferred alternative will not have the potential to disproportionately affect the safety or health of children, and will be in full compliance with Executive Order 13045 following completion of the NEPA process.

5.18.8 Invasive Species

Introduction of invasive species has the potential to affect the economic, ecological, and human health of areas in which these species become established. The federal government, by presidential authority and the authority of other pertinent statutes, is charged with controlling and preventing introduction of harmful invasive species.

Planting of any vegetation will not be a component of this project. For stabilization purposes, the toe berms will be seeded to prevent sedimentation into the nearby waters. Seed species type will depend on the time of year to be applied, and seed mixture will not include noxious or invasive species. Therefore, the preferred alternative will not have the potential to introduce or otherwise promote invasive species, and will be in full compliance with Executive Order 13112 following completion of the NEPA process.

5.18.9 Protection of Migratory Birds

The Executive Order directs federal agencies that take actions that either directly or indirectly effect on migratory birds to develop a Memorandum of Understanding (MOU), and to work with the U.S. Fish & Wildlife Service and other federal agencies to promote the conservation of migratory bird populations.

The Migratory Bird Treaty Act is a United States federal law, first enacted in 1916 in order to implement the convention for the protection of migratory birds. The statute makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations. The statute does not discriminate between live or dead birds and also grants full protection to any bird parts including feathers, eggs, and nests.

Construction of the dike raise and toe berm will not result in any significant adverse impacts to migratory bird species or their habitat. There may be some temporary displacement during construction; however, there is no anticipated taking of birds. The preferred alternative will not violate applicable migratory bird species, and will be in full compliance with Executive Order 13186 following completion of the NEPA process.

5.19 Conclusion.

Based on findings described in this report, it is in the federal interest to implement the preferred alternative of raising the existing dikes to an elevation of 50 feet NAVD 88 and constructing a supportive toe berm. The proposed action will meet the purpose and need by providing long-term dredge material disposal for the upper Wilmington Harbor, and the dredged material disposal meets the federal standard.

Table 8 details significant environmental factors and impacts taken into consideration. Project construction will result in permanent impacts to 39 acres of coastal marsh, temporary impacts to benthic habitat and terrestrial vegetation and short-term impacts to water quality, air quality, and noise levels in the project area. Overall benefits of the preferred alternative, however, include long-term regional socio-economic benefits by providing a financially feasible dredge material disposal facility for the next 16 years.

6.0 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

Table 10 lists the compliance status of the major Federal Laws, policies, and Executive Orders that were applicable or considered for the project. This project is considered in "Full compliance" once all the requirements of the NEPA process are complete.

Table 10. 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
Anadromous Fish Conservation Act of 1965, As Amended	16 USC 757 a et seq.	Full
Antiquities Act of 1906, As Amended	16 USC 431	Full
Archeological and Historic Preservation Act of 1974, As Amended	16 USC 469	Full
Archeological Resources Protection Act of 1979, As Amended	16 USC 470	Full
Clean Air Act of 1972, As Amended	42 USC 7401 et seq.	Full
Clean Water Act of 1972, As Amended	33 USC 1251 et seq.	Full
Coastal Zone Management Act of 1972, As Amended	16 USC 1451 et seq.	Full
Endangered Species Act of 1973	16 USC 1531	Full
Estuary Program Act of 1968	16 USC 1221 et seq.	Full
Equal Opportunity	42 USC 2000d	Full
Farmland Protection Policy Act	7 USC 4201 et seq.	Full
Fish and Wildlife Coordination Act of 1958, As Amended	16 USC 661	Full
Historic and Archeological Data Preservation	16 USC 469	Full
Historic Sites Act of 1935	16 USC 461	Full
Magnuson Fishery Conservation and Management Act – Essential Fish Habitat	16 USC 1801	Full
National Environmental Policy Act of 1969, As Amended	42 USC 4321 et seq.	Full
National Historic Preservation Act of 1966, As Amended	16 USC 470	Full
National Historic Preservation Act Amendments of 1980	16 USC 469a	Full
Native American Religious Freedom Act of 1978	42 USC 1996	Full

*** Full compliance once the NEPA process is complete.**

7.0 AGENCY AND PUBLIC INVOLVEMENT

7.1 Agency and Public Coordination

A scoping meeting and site visit were held on March 4, 2015 with the NC Division of Coastal Management, the NC Division of Water Resources, the US Fish and Wildlife Service, the National Marine Fisheries Service, NC Division of Marine Fisheries, and the NC Wildlife Resources Commission. The purpose was to discuss the proposed project and to assess the potential impact areas for mitigation.

A scoping letter was sent on April 17, 2015 to representatives of the agencies above as well as the NC Division of Cultural Resources. This allowed for a 30 day comment period on the project soliciting comments on the project and proposed mitigation. In addition, a teleconference was held on April 20 with the NC Division of Mitigation Services and the USACE.

No comments were received on the project design or mitigation proposal during the scoping process.

7.2 North Carolina Coastal Management Program

The proposed project is in New Hanover and Brunswick Counties, which is part of the designated coastal zone of the State of North Carolina. Since the proposed project includes significant discharge of fill in coastal intertidal marsh, a consistency concurrence is required from the North Carolina Coastal Management Program. A consistency determination has been submitted to the N.C. Division of Coastal Management along with a copy of this EA.

7.3 Clean Water Act (CWA)

7.3.1 Section 404. Due to the need to discharge dredged or fill material into Waters of the U.S., a Section 404(b)(1) (P.L. 95-217) evaluation for the proposed project is required and included in Appendix A.

7.3.2 Section 401. A Section 401 Water Quality Certificate under the CWA of 1977 (P.L. 95-217), as amended, is required for the proposed disposal of material to construct the toe berms, and would be obtained from the N.C. Department of Environmental Quality (DEQ), Division of Water Resources, before construction begins.

7.3.3 Sea Level Rise

In accordance with ER 1100-2-8162 dated 31 December 2013, potential relative sea level change must be considered in every USACE coastal activity as far inland as the extent of estimated tidal influence. The Eagle Island CDF in the Cape Fear River is at sea level and water levels are subject to diurnal tidal fluctuations.

In an effort to conform to Engineering Technical Letter 1100-2-1, an analysis of the project impacts relative to increased sea levels over the remaining project life of the Eagle Island Improvements Dike Raise (2017-2100) was conducted. The analysis

included development of relative sea level rise projection curves, identification of potential impact areas and associated risks, and establishing adaptive measures to adjust to future sea level rise. The recommended plan for this project only includes localized changes to the dike elevation and toe berm with limited exposure to sea level rise. Accordingly, a detailed evaluation of the potential effects, both positive and negative, of sea level rise, on both the federal and non-federal project features (port infrastructure, transportation, etc.) of the overall project is considered inappropriate. Instead, only an abbreviated Tier 1 analysis was performed to help inform the study approval. The recommended plan will not meaningfully alter existing coastal processes. So, the evaluation was limited to effects on project maintenance.

Using the methods published in ETL 1100-2-1, the relative sea level rise curves were developed for “low,” “intermediate,” and “high” rates of future sea-level change. The “low” sea level change curve is simply an extrapolation of the observed sea-level trend obtained at the Wilmington tide gauge station. The “intermediate” curve represents sea level rise using the National Research Council (NRC) Curve I and the “high” curve represents NRC Curve III.

The Wilmington tide gauge used in this analysis is a long term gauge with data collection from 1935 through 2015. This long term gauge has collected greater than 80 years of data and is the closest gauge to the project location, as seen in Figure 7. As shown in Figure 8, the gauge is located within close proximity of the project area and should provide an ideal representation of historic sea level rise affecting the project.

Figure 9 shows the sea level rise curves developed in response to ETL 1100-2-1 using the sea level change curve calculator (v 2015.46) developed by the USACE. The curves cover a 100 year duration of the proposed improvements which are planned for implementation in 2017. The curves shown in Figure 9 include the global eustatic sea level rise plus increases due to isostatic changes. The trend established at the Wilmington gauge shows sea level change on average is 0.00699 feet/year. Projecting the observed sea level rise rate over the next 20, 50, and 100 years of the project life shows an increase of 0.14, 0.35, and 0.70 feet, respectively when looking at the historic curve extrapolation. The corresponding time period increases found using the NRC Curve III projection are 0.66, 2.20, and 6.26.

In examining the applications and potential risks of sea level rise as it applies to the dike improvements, the modifications proposed in this project are found to have limited exposure to the effects of sea level rise and no associated risks. The project consists of increasing dike elevation in two foot increments to a maximum height of 50 feet by year 2032. The areas of the project exposed to the effects of sea level rise are limited to increased water levels outside of the diked disposal area along the toe berm of the dike.

An increase in sea level would have limited negative impact over the life of the project. The purpose of the dike raise is to increase upland disposal area for the dredging of the upper Wilmington Harbor navigation channel. Increased sea level rise will not impact the available disposal volume within the diked area. Water level increases would not impact dredging quantities placed within the upland disposal area due to the fact that the same depths as related to mean low water would be maintained. Even though water level heights would increase over the life of the project, dredging depths would remain constant below the new mean low water surface elevations. Sea level rise could potentially impact the toe berm construction of the dike which is used to stabilize the interior dike elevation increases. In the event of extreme water level increases, the toe berm could be relatively easily modified by adding additional material on the top portion of the proposed toe berm without any additional environmental clearances.

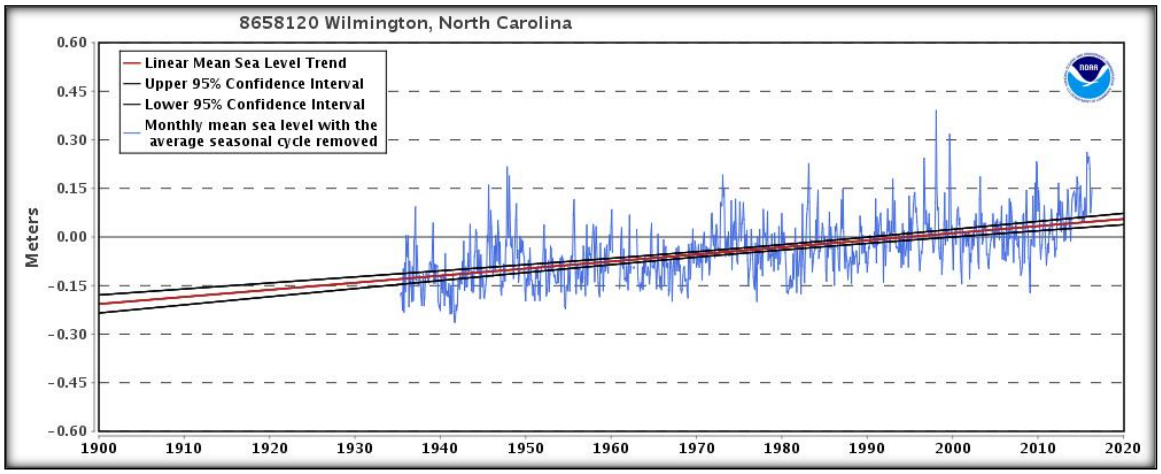

Figure 8. Wilmington Tidal Gauge Historic Sea Level Trend

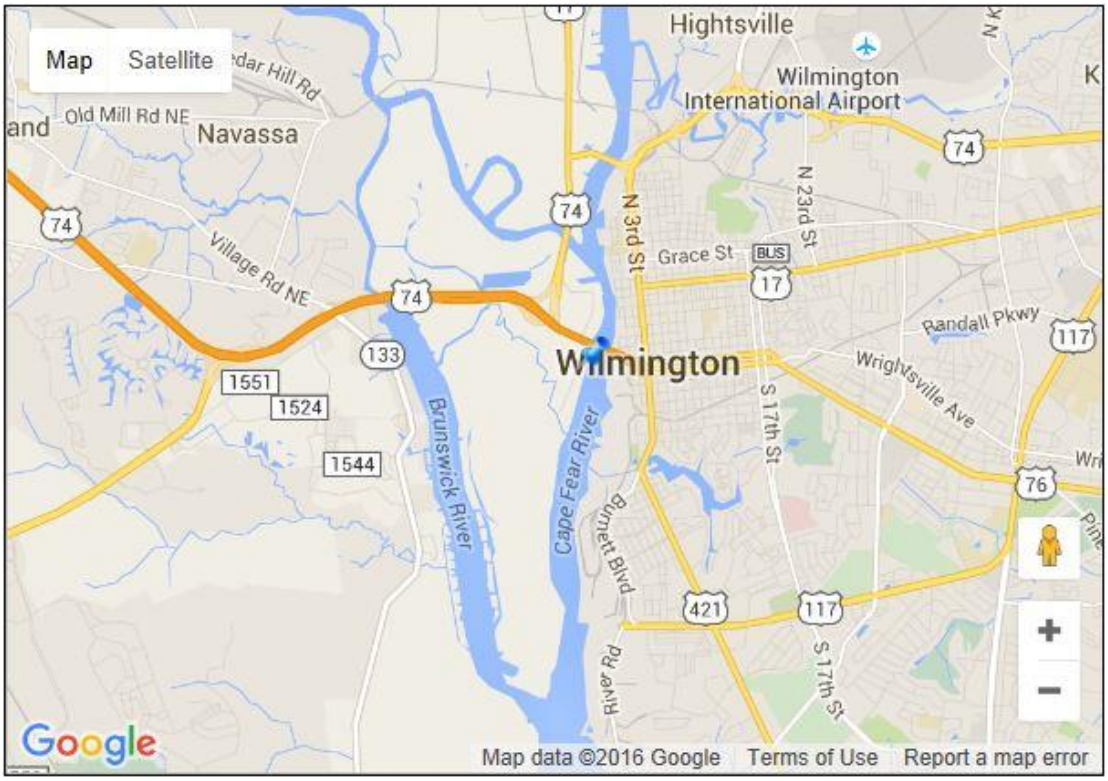

Figure 9. Wilmington Tidal Gauge Location (Blue Pin)

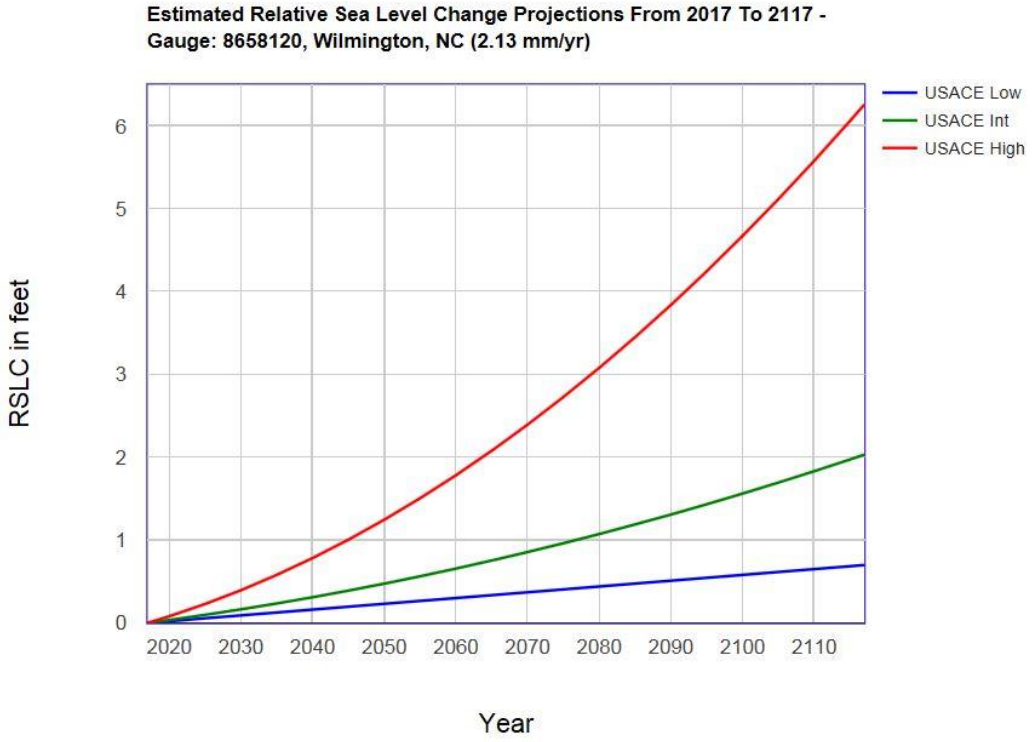

Figure 10. Relative Sea Level Rise Curves

7.4 Coordination of this Document

The proposed action and the environmental impacts of the proposed action are addressed in this EA. The EA will be made available to an extensive list of local, State and federal regulatory agencies and the public for a 30-day review and comment period. A list of recipients has been included as Appendix B of this document. The EA will also be placed on the Wilmington District Website at: http://www.saw.usace.army.mil/Missions/Navigation/Dredging/Wilmington-Harbor/Eagle-Island/.

8.0 POINT OF CONTACT

Any comments or questions regarding this EA should be directed to:

Ms. Emily Hughes, CESAW-PE, U.S. Army Engineer District, Wilmington, 69 Darlington Avenue, Wilmington, North Carolina 28403-1343. Telephone (910) 251-4635, email Emily.b.hughes@usace.army.mil

9.0 REFERENCES

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APPENDIX A

EVALUATION OF SECTION 404(b)(1)
(PUBLIC LAW 95-217) GUIDELINES 40 CFR 230

An evaluation of the placement of dredge and/or fill material into waters of the United States includes the standard form.

EAGLE ISLAND DIKE RAISE TO 50FT
BRUNSWICK AND NEW HANOVER COUNTIES, NORTH CAROLINA

Preliminary Evaluation of Section 404 (b) (1) Guidelines 40 CFR 230

This evaluation covers the placement of all fill material into waters and wetlands of the United States required for the improvements to Cells 1 – 3 at Eagle Island Confined Disposal Facility (CDF), Brunswick and New Hanover Counties, North Carolina. The proposed project includes incremental dike raises to elevation 50 feet and requires the construction of a supportive toe berm. The toe berm will require placement of material into approximately 39 acres of intertidal marsh. Please note, prior to any construction, the required Section 401 Water Quality Certificates from the NC Division of Water Resources will be obtained for the project and all 401 conditions/restrictions will be met.

		Preliminary 1/	**Final 2/**
1.	Review of Compliance (230.10(a)-(d)) A review of the NEPA Document indicates that:		
a.	The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose (if no, see section 2 and NEPA document);	YES ☒ NO☐	YES ☐ NO☐
b.	The activity does not: 1) violate applicable State water quality standards or effluent standards prohibited under Section 307 of the CWA; 2) jeopardize the existence of federally listed endangered or threatened species or their habitat; and 3) violate requirements of any federally designated marine sanctuary (if no, see section 2b and check responses from resource and water quality certifying agencies);	YES☒ NO☐*	YES☐ NO☐
c.	The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values (if no, see section 2);	YES☒ NO☐	YES☐ NO☐
d	Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem (if no, see section 5).	YES☒ NO☐*	YES☐ NO☐

Proceed to Section 2

*, 1, 2

2. Technical Evaluation Factors (Subparts C-F)	N/A	Not Significant	Significant
a. Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C)			
(1) Substrate impacts.		X	
(2) Suspended particulates/turbidity impacts		X	
(3) Water column impacts.		X	
(4) Alteration of current patterns			
and water circulation.		X	
(5) Alteration of normal water			
fluctuations/hydroperiod.		X	
(6) Alteration of salinity gradients.	NA	X	
b. Biological Characteristics of the Aquatic Ecosystem (Subpart D)			
(1) Effect on threatened/endangered			
species and their habitat.		X	
(2) Effect on the aquatic food web.		X	
(3) Effect on other wildlife (mammals			
birds, reptiles, and amphibians).		X	
c Special Aquatic Sites (Subpart E)			
(1) Sanctuaries and refuges.	NA		
(2) Wetlands.		X	
(3) Mud flats.	NA		
(4) Vegetated shallows.	NA		
(5) Coral reefs.	NA		
(6) Riffle and pool complexes.	NA		
d. Human Use Characteristics (Subpart F)			
(1) Effects on municipal and private water supplies.	NA		
(2) Recreational and commercial fisheries impacts		X	
(3) Effects on water-related recreation.		X	
(4) Aesthetic impacts.		X	
(5) Effects on parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves.	NA		

Remarks: Where a check is placed under the Significant category, preparer add explanation below.

Proceed to Section 3

3. Evaluation of Dredged or Fill Material (Subpart G) 3/

a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. (Check only those appropriate.)

(1) Physical characteristics ☒

(2) Hydrography in relation to known or anticipated sources of contaminants ☒

(3) Results from previous testing of the material or similar material in the vicinity of the project ☒

(4) Known, significant sources of persistent pesticides from land runoff or percolation ☒

(5) Spill records for petroleum products or designated (Section 311 of CWA) hazardous substances ☒

(6) Other public records of significant introduction of contaminants from industries, municipalities, or other sources ☒

(7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities ☒

(8) Other sources (specify). ☐

List appropriate references.

Reference: See Eagle Island Dike Raise to 50ft DRAFT EA

b. An evaluation of the appropriate information in 3a above indicates that there is reason to believe the proposed dredge or fill material is not a carrier of contaminants, or that levels of contaminants are substantively similar at extraction and disposal sites and not likely to result in degradation of the disposal site. YES ☒ NO☐*

Proceed to Section 4
*, 3

4. Disposal Site Determinations (230.11(f)).

a. The following factors as appropriate, have been considered in evaluating the disposal site.

(1) Depth of water at disposal site. ☒

(2) Current velocity, direction, and variability at disposal site ☒

(3) Degree of turbulence. ☒

(4) Water column stratification ☒

(5) Discharge vessel speed and direction ☒

(6) Rate of discharge ☒

(7) Dredged material characteristics (constituents, amount and type of material, settling velocities). ☒

(8) Number of discharges per unit of time. ☒

(9) Other factors affecting rates and patterns of mixing (specify)

List appropriate references.

Reference: See Eagle Island Dike Raise to 50ft DRAFT EA

b. An evaluation of the appropriate factors in 4a above indicates that the disposal site and/or size of mixing zone are acceptable. YES ☒ NO ☐*

5. Actions to Minimize Adverse Effects (Subpart H).

All appropriate and practicable steps have been taken, through application of recommendations of 230.70-230.77, to ensure minimal adverse effects of the proposed discharge.

YES ☒ NO ☐*

Reference: See Eagle Island Dike Raise to 50ft DRAFT EA

Return to section 1 for final stage of compliance review.
See also note 3/, page 3.

Proceed to Section 6

6. Factual Determinations (230.11).

A review of appropriate information as identified in items 2-5 above indicates that there is minimal potential for short- or long-term environmental effects of the proposed discharge as related to:

a. Physical substrate at the disposal site (review sections 2a, 3, 4, and 5). YES ☒ NO ☐*

b. Water circulation, fluctuation, and salinity (review sections 2a, 3, 4, and 5). YES ☒ NO ☐*

c. Suspended particulates/turbidity (review sections 2a, 3, 4, and 5). YES ☒ NO ☐*

d Contaminant availability (review sections 2a, 3, and 4). YES ☒ NO ☐*

e. Aquatic ecosystem structure and function (review sections 2b and c, 3, and 5). YES ☒ NO ☐*

f. Disposal site (review sections 2, 4, and 5). YES ☒ NO ☐*

g. Cumulative impact on the aquatic ecosystem. YES ☒ NO ☐*

h. Secondary impacts on the aquatic ecosystem. YES ☒ NO ☐*

7. Findings.

a.The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines. . . . . .☒

b.The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines with the inclusion of the following conditions:. . . . . .☐

c.The proposed disposal site for discharge of dredged or fill material does not comply with the Section 404(b)(1) guidelines for the following reasons(s):

(1)There is a less damaging practicable alternative . . . . . ☐

(2)The proposed discharge will result in significant degradation of the aquatic ecosystem . . . . . ☐

(3) The proposed discharge does not include all practicable and appropriate measures to minimize potential harm to the aquatic ecosystem. . . . . ☐

8.

_____

Kevin P. Landers Sr.
Colonel, U.S. Army
District Engineer

Date: _____

*A negative, significant, or unknown response indicates that the permit application may not be in compliance with the Section 404(b)(1) Guidelines.

1/ Negative responses to three or more of the compliance criteria at this stage indicate that the proposed projects may not be evaluated using this "short form procedure." Care should be used in assessing pertinent portions of the technical information of items 2 a-d, before completing the final review of compliance.

2/ Negative response to one of the compliance criteria at this stage indicates that the proposed project does not comply with the guidelines. If the economics of navigation and anchorage of Section 404(b)(2) are to be evaluated in the decision-making process, the "short form evaluation process is inappropriate."

3/ If the dredged or fill material cannot be excluded from individual testing, the "short-form" evaluation process is inappropriate.

APPENDIX B

LIST OF DRAFT EA RECIPIENTS

Renee Gledhill-Earley
NCDCR
4617 Mail Service Center
Raleigh, NC 27699-4617

Karen Higgins
NCDEQ-DWR
401 & Buffer Permitting
1650 Mail Service Center
Raleigh, NC 27699-1617

David Cox
NCWRC
1718 NC Hwy. 56 West
Creedmoor, NC 27522

Ken Riley
NMFS
101 Pivers Island Road
Beaufort, NC 28516

Fritz Rohde
NMFS
101 Pivers Island Road
Beaufort, NC 28516

Kathy Matthews
USFWS
P.O. Box 33726
Raleigh, NC 27636-3726

Pete Benjamin
USFWS
P.O. Box 33726
Raleigh, NC 27636-3726

Curtis Weaver
USGS- NC Office
3916 Sunset Ridge Road
Raleigh, NC 27607

Paul Cozza
NC State Ports Authority
PO Box 9002
Wilmington, NC 28402

Doug Huggett
Division of Coastal Management
400 Commerce Ave.
Morehead City, NC 28557

Debbie Wilson
NC Division of Coastal Management
127 Cardinal Drive Ext.
Wilmington, NC 28405

Debra Collins
NC Department of Transportation
1550 Mail Service Center
Raleigh, NC 27699

Chris O'Keefe
New Hanover County
230 Government Center Drive, Suite 100
Wilmington, NC 28403

Sterling Cheatham
City of Wilmington
PO Box 1810
Wilmington, NC 28402

David Hollis
Town of Leland
102 Town Hall Drive
Leland, NC 28451

Lee Taylor
Town of Belville
497 Olde Waterford Way, Suite 205
Belville, NC 28451

Kemp Burdette
Cape Fear River Watch
617 Surry Street
Wilmington, NC 28401

Scott Aldridge
Cape Fear Pilots Association
111 W. Bay Street, PO Box 10070
Southport, NC 28461

Lyn Hardison
SEPA Review Coordinator
NC Dept of Env Qulaity
1601 Mail Service Center
Raleigh NC 27699-1601

Roy Crabtree
NOAA Fisheries, Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

Crystal Best
State Clearinghouse, NC Dept. of Admin.
1301 Mail Service Center
Raleigh, NC 27699-1301

Daniel Govoni
Division of Coastal Management
400 Commerce Ave.
Morehead City, NC 28557

Dan Holliman
USEPA Region 4
61 Forsyth St. SE
Atlanta, GA 30303-8960

Walker Golder
National Audubon Society
7741 Market St., Unit D
Wilmington, NC 28411

Arthur Wendel
Center for Disease Control and Prevention
4770 Buford Hwy
Atlanta, GA 30341

Gregory Richardson
NC Commission of Indian Affairs
1317 Mail Service Center
Raleigh, NC 27699-1317

US Coast Guard Marine Safety Office
721 Medical Center Dr., Ste 100
Wilmington, NC 28401

Curtis Davis
US Dept. of Housing and Urban Developmen
1500 Pinecroft Rd, Ste. 401
Greensboro, NC 27407

USDA Natural Resources Conservation Service

4407 Bland Rd., Ste 117
Raleigh, NC 27609

Orrin Pilkey
Duke University
103 Old Chem, Box 90227
Durham, NC 27708-0228

NC Collection- Joyner Library
East Carolina University
East 5th Street
Greenville, NC 27858-4353

Joyce Stanley
DOI
Env. Policy and Compliance
75 Spring St. SW, Ste 1144
Atlanta, GA 30303

Todd Miller
NC Coastal Federation
3609 NC 24.
Newport, NC 28570