

**HOLDEN BEACH EAST END
SHORE PROTECTION PROJECT
ENVIRONMENTAL IMPACT STATEMENT
DRAFT**



August 2015

Prepared for:

**US Army Corps of Engineers, Wilmington District
Wilmington, NC**

and

Town of Holden Beach

Prepared by:

**Dial Cordy and Associates Inc.
(Third Party Contractor)
Wilmington, NC**

EXECUTIVE SUMMARY

The barrier island of Holden Beach (eight miles long) is located west of the Cape Fear River and has an east-west orientation, facing Long Bay and the open Atlantic Ocean to the south, and separated from mainland Brunswick County to the north by tidal marshes and the Atlantic Intracoastal Waterway (AIWW). Holden Beach is located along the eastern portion of Brunswick County. The island was incorporated in 1969 and has a current year-round resident population of approximately 575, with a seasonal population of over 10,000. The Town of Holden Beach (Town) is seeking federal and state permits to allow the construction of a 30-year shoreline protection project that would serve to mitigate chronic erosion experienced along the eastern portion (Station 40+00 east to LFI) on the Town's oceanfront shoreline so as to protect and secure public infrastructure, roads, homes, businesses, beaches, recreational assets, and protective dunes.

Due to the extreme erosion on the East End of Holden Beach, a temporary terminal groin field was constructed in the 1970s along the East End of Holden Beach. While the groin field was successful and economical, the temporary nature of the nylon material and the lack of ongoing nourishment activities limited its long-term effectiveness. Town-sponsored projects have collectively placed 825,900 cubic yards (cy) of beach compatible material on the oceanfront shoreline, primarily to the east of station 110+00. Historically, the Town has not implemented beach fill projects on the East End, but instead has relied on United States Army Corps of Engineers' (USACE) navigation maintenance dredging projects for East End sand placement.

While the majority of the Holden Beach oceanfront shoreline has experienced long-term net erosion over the last 70 years, erosion has been most severe along the island's easternmost 2-mile reach bordering Lockwoods Folly Inlet (LFI). Average long-term erosion rates along the East End reach are among the highest in the state, ranging from -3 to -8 feet (ft)/year. Chronic erosion has contributed to dune breaching and flooding along the East End, most recently during Hurricane Hanna in 2008. Since 1993, East End erosion has resulted in the loss of approximately 27 oceanfront properties (including houses and infrastructure). Periodic nourishments by both the Town and the USACE have provided temporary shore protection benefits along the East End; however, the rapid loss of placed sand to erosion necessitates repeated, costly nourishment events approximately every two years. To date, the Town's East End shore protection strategy has been one of reliance on frequent USACE beneficial use of dredged material projects that are funded primarily by the USACE; however, the long-term status of federal funding is precarious. Thus, a long-term, cost-effective, independent Town shore protection program is needed to combat chronic East End erosion.

The Town's Preferred Alternative (Alternative 6 – Intermediate Terminal Groin with Beach Nourishment) would assume responsibility for East End shore protection through the construction of an ~1,000-ft-long intermediate terminal groin at the eastern end of the oceanfront beach between Stations 00+00 and 10+00 and the implementation of an independent 30-year beach nourishment plan. The main stem of the intermediate terminal groin

would include a 700-ft-long segment extending seaward from the toe of the primary dune and a ~300-ft anchor segment extending landward from the toe of the primary dune. The groin would also include a 120-ft-long shore parallel T-Head segment centered on the seaward terminus of the main stem. The anchor segment is designed to prevent flanking of the groin in the event of shoreline migration landward of the primary dune. The anchor segment would be entirely buried at the completion of groin construction, and the majority of the anchor segment is designed to remain buried based on historical shoreline analyses back to 1938. The intermediate groin is designed to be a relatively low profile structure, both to allow sand over-passing and to minimize impacts to beach recreation and aesthetics. In addition to the 300-ft anchor segment, a portion of the adjoining 700-ft segment across the upper dry beach would also be completely buried, thus maintaining recreational beach access across the groin. The relatively low profile of the groin would allow some sand over-passing even under eroded conditions at the end of the four-year nourishment cycle.

The intermediate groin would be constructed of 4- to 5-ft-diameter granite armor stone, thus providing the “leaky” characteristic that allows sand to pass through the structure. To prevent settlement of the stone, and if necessary to facilitate modification or removal of the groin, a base layer of geo-textile matting (1-ft thick) would be installed below grade prior to armor stone placement. The rubble mound (i.e., armor stone) component of the groin would have a crest width of ~5 ft and a base width of ~40 ft, whereas the underlying geo-textile base layer would have a slightly greater width of ~45 ft. The relatively short length of the intermediate groin along with the large tidal range at Holden Beach would allow for construction of the groin entirely from shore. It is anticipated that the public access parking lot would provide the necessary beach access, staging, and storage areas for construction activities.

The projected beach nourishment regime would involve the placement of ~120,000 – 180,000 cy of sand on the East End beach extracted from the preferred Lockwoods Folly AIWW Inlet Crossing (LFI)/Bend-Widener borrow site every four years, with the addition of potential supplemental sand acquisition from the inland LFI navigation channel and Central Reach offshore borrow site. The beach fill profile design include a +9 ft North American Vertical Datum (NAVD) high dune with a 50-ft-wide crest, a +7 ft NAVD high, ~200-ft-wide berm, and a 90- to 200-ft-wide transition with a 15 percent slope.

This Environmental Impact Statement (EIS) includes an evaluation of resources and considerations involved in responding to the chronic erosion on the eastern portion of Holden Beach so as to preserve the integrity of its infrastructure, provide protection to existing development, and ensure the continued use of the oceanfront beach along the easternmost portion of its oceanfront shoreline. Significant resources which occur in the permit area include socioeconomic resources, marine resources, terrestrial resources, threatened and endangered species, recreation and aesthetic resources, and cultural resources.

This Draft EIS contains the following information:

Chapter 1 – Introduction: Explains the purpose of the development of an EIS, describes agency and public coordination efforts, issues, and concerns elicited by the development of the EIS and discusses applicable laws, rules, and regulations.

Chapter 2 - Purpose and Need: Identifies purpose and needs of the project and discusses how the shoreline along Holden Beach has been managed in the past.

Chapter 3 - Project Alternatives: Describes project rationale and alternatives considered.

Chapter 4 - Affected Environment: Identifies existing resources which occur in the permit area.

Chapter 5 - Environmental Consequences: Evaluates the project alternatives and discusses the anticipated changes to the existing environment including direct, indirect, and cumulative effects.

Chapter 6 - Avoidance, Minimization and Mitigative Measures: Describes conservation measures incorporated to avoid or minimize adverse effects to resources.

Major Conclusions

Chronic erosion has been a major threat to the homes, infrastructure, and natural resources along the eastern portion of Holden Beach. Immediate and long-term action is needed to alleviate this threat. The Town is seeking federal and state permits to allow for the construction of a terminal groin with supplemental fill west of the structure obtained from the LFIX. These actions would serve to mitigate the chronic erosion on the eastern portion of the island so as to preserve the integrity of its infrastructure, provide protection to existing development, and ensure the continued use of the oceanfront beach.

Next Steps

It is expected that state and federal agencies along with the public will provide comments to this Draft EIS which will result in a comprehensive analysis of alternatives including proposed inlet management initiatives. On-going coordination with the North Carolina Division of Coastal Management will continue and the details of the implementation stages are expected by the release of the Final Environmental Impact Statement.

TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY	II
LIST OF TABLES.....	VII
LIST OF FIGURES	VIII
LIST OF PHOTOS	X
LIST OF ACRONYMS.....	XI
1.0 INTRODUCTION.....	1-1
1.1 What is the purpose of an Environmental Impact Statement?.....	1-1
1.2 What is the NEPA EIS process and how does it relate to Holden Beach’s proposed project?.....	1-1
1.3 How has the public been involved?.....	1-2
1.4 How have government agencies been involved?	1-3
1.5 What is the Holden Beach East End Shore Protection Project and where is it located?.....	1-6
1.6 What issues were identified as part of scoping?	1-13
1.7 What laws are involved?	1-17
2.0 PURPOSE & NEED	2-1
2.1 What is the purpose of the Proposed Action and why is it needed?	2-1
2.2 How has the Holden Beach shoreline been managed in the past?	2-1
2.3 What is the need for the Proposed Action?.....	2-7
3.0 PROJECT ALTERNATIVES.....	3-1
3.1 What Alternatives are Evaluated in this DEIS?	3-1
3.1.1 Alternative 1: No Action	3-1
3.1.2 Alternative 2: Abandon and Retreat.....	3-7
3.1.3 Alternative 3: Beach Nourishment	3-8
3.1.4 Alternative 4: Inlet Management and Beach Nourishment	3-12
3.1.5 Alternative 5: Short Terminal Groin and Beach Nourishment.....	3-14
3.1.6 Alternative 6: Intermediate Terminal Groin and Beach Nourishment.....	3-20
4.0 AFFECTED ENVIRONMENT	4-1
4.1 What is the Environmental Setting of the Project?	4-1
4.2 Sediment Transport Processes.....	4-5
4.3 Marine Habitats and Communities in the Permit Area.....	4-6
4.3.1 Marine Benthic Communities	4-6
4.3.2 Water Column.....	4-10
4.4 Beach and Dune Communities in the Permit Area	4-12
4.4.1 Intertidal Ocean Beach	4-12
4.4.2 Dry Ocean Beach and Dune	4-13
4.4.3 Maritime Upland Forest Communities	4-14
4.5 Inlet and Estuarine Communities in the Permit Area	4-15
4.5.1 LFI Complex	4-15
4.5.2 Estuarine Communities.....	4-16
4.6 Endangered, Threatened, and Rare Species and Species of Concern	4-22
4.6.1 Federally Listed Species.....	4-22
4.6.2 State-Listed Species and Federal Species of Concern	4-49
4.7 Cultural Resources in the Permit Area.....	4-52
4.8 Public Interest Resources in the Permit Area.....	4-52
4.8.1 Socioeconomic Resources.....	4-52

4.8.2	Land Use	4-60
4.8.3	Infrastructure.....	4-61
4.8.4	Scenic Resources.....	4-62
4.8.5	Light.....	4-63
4.8.6	Water Quality	4-63
4.8.7	Air Quality	4-64
4.8.8	Floodplains	4-64
4.8.9	Navigation.....	4-67
4.8.10	Noise	4-67
4.8.11	Water Safety	4-68
5.0	ENVIRONMENTAL CONSEQUENCES	5-1
5.1	Alternatives Eliminated from Further Consideration	5-1
5.2	Impact Analysis Methodology	5-3
5.2.1	Direct and Indirect Impact Analysis	5-4
5.2.2	Cumulative Impact Analysis	5-5
5.3	Projected Effects of the Alternatives on Shoreline Change	5-10
5.4	Projected Environmental Impacts of the Alternatives	5-23
5.4.1	Alternative 1: No Action	5-23
5.4.2	Alternative 2: Abandon and Retreat	5-52
5.4.3	Alternative 3: Beach Nourishment.....	5-66
5.4.4	Alternative 4: Outer Inlet Channel Management and Beach Nourishment.....	5-90
5.4.5	Alternative 5: Short Terminal Groin and Beach Nourishment	5-119
5.4.6	Alternative 6: Intermediate Terminal Groin and Beach Nourishment	5-142
6.0	AVOIDANCE, MINIMIZATION AND MITIGATIVE MEASURES.....	6-1
6.1	Terminal Groin Design Features.....	6-1
6.2	Dredging Measures	6-2
6.3	Beach Fill Placement Measures	6-4
6.4	Inlet Management Plan.....	6-5
6.5	Conservation Measures.....	6-7
7.0	REFERENCES.....	7-1
Appendix A	Scoping Documents	
Appendix B	SB 151 Legislation	
Appendix C	Inlet Management Plan	
Appendix D	Holden Beach Master Plan	
Appendix E	Holden Beach Work Plan	
Appendix F	ATM Engineering Analysis	
Appendix G	Holden Beach Permit Sheets	
Appendix H	Holden Beach Resolution	
Appendix I	Lockwoods Folly Inlet Historical Aerial Imagery	
Appendix J	Annotated Bibliography of Nearshore and Estuarine Fisheries	
Appendix K	Bird Nesting Data (1972-2014)	
Appendix L	Sea Turtle Nesting Locations (2005-2014)	
Appendix M	Understanding Cost and Benefits	
Appendix N	Central Reach Project Permits	
Appendix O	Environmental Consequences Impact Summary	
Appendix P	Eastern Channel Shorebird Monitoring Plan	

LIST OF TABLES

	Page
Table 1.1. Project Review Team members.....	1-3
Table 1.2. Summary of scoping comments provided during the Public Scoping and Public Notice process.....	1-14
Table 2.1. Town of Holden Beach nourishment summary over the last decade.....	2-5
Table 3.1. Project alternatives.....	3-1
Table 3.2. Summary of borrow area alternatives with NCDCM sediment compatibility criteria.....	3-12
Table 4.1. Biotic communities in the Permit Area.....	4-4
Table 4.2. Federally listed species.....	4-23
Table 4.3. State-listed species.....	4-51
Table 4.4. Demographic summary.....	4-54
Table 4.5. Housing characteristics.....	4-55
Table 4.6. Economic impact of beach recreation.....	4-56
Table 4.7. Value of taxable real property FY 2011/2012.....	4-56
Table 4.8. Land use summary.....	4-61
Table 5.1. Project alternatives.....	5-4
Table 5.2. Holden Beach and Oak Island shore protection projects.....	5-6
Table 5.3. Year 4 model-projected net habitat change (acres).....	5-14
Table 5.4. Model-projected East End relative beach widths (0 ft NAVD88).....	5-20
Table 5.5. Maximum percentage of daily (24-hr) inlet flow volume entrained during dredging.....	5-34
Table 5.6. Alternative 1 scope of costs and benefits.....	5-51
Table 5.7. Alternative 2 model-simulated tidal prism volumes (100 mcf).....	5-54
Table 5.8. Alternative 2 scope of costs and benefits.....	5-67
Table 5.9. Alternative 3 - relative tidal prism volumes (percentage of corresponding Alternative 2 volumes).....	5-72
Table 5.10. Alternative 3 scope of costs and benefits.....	5-91
Table 5.11. LFI Model-projected ebb shoal sediment volume change (cubic yards).....	5-94
Table 5.12. Alternative 4 relative tidal prism volumes (percentage of corresponding Alternative 2 volumes).....	5-97
Table 5.13. Alternative 4 scope of costs and benefits.....	5-118
Table 5.14. Alternative 5 relative tidal prism volumes (percentage of corresponding Alternative 2 volumes).....	5-124
Table 5.15. Alternative 5 scope of costs and benefits.....	5-141
Table 5.16. Alternative 6 relative tidal prism volumes (percentage of corresponding Alternative 2 volumes).....	5-145
Table 5.17. Alternative 6 scope of costs and benefits.....	5-159

LIST OF FIGURES

	Page
Figure 1.1. Study Area Map	1-7
Figure 1.2. Long-term Average Annual Erosion Rates for East Holden Beach (2003 vs. 2011)	1-9
Figure 1.3. Long-term Average Annual Erosion Rates for West Oak Island (2003 vs. 2011).....	1-10
Figure 1.4. Holden Beach East End Dune Restoration Activities Following Hurricane Hanna	1-12
Figure 2.1. Central Reach and East End Reaches on Holden Beach with Beach Fill Placements since 2001.	2-2
Figure 2.2. 1970s Groin Layout on East End of Holden Beach.....	2-3
Figure 2.3. Groin Construction and Placement in 1970s	2-4
Figure 2.4. 1993 and 2008 Aerial Comparison – East End.....	2-9
Figure 3.1. USACE LFIX AIWW Dredging and Beach Placement Schematic.....	3-3
Figure 3.2. LFIX Federal Navigation Project (includes bend widener and AIWW).	3-4
Figure 3.3. 2015 Hydrographic Survey of the LFIX and AIWW Crossing	3-5
Figure 3.4. Alternative 3 – Conceptual East End Beach Fill Footprint.....	3-9
Figure 3.5. Alternative 3 – Conceptual East End Beach Fill Profile (Dune ~50 ft wide, Berm ~200 ft wide	3-10
Figure 3.6. Alternative 3 – Preferred and Potential Borrow Sites	3-11
Figure 3.7. Alternative 4 – Conceptual Beach Fill and Outer Inlet Channel Footprint	3-13
Figure 3.8. Alternative 5 – Conceptual Beach Fill and Short Terminal Groin Footprint	3-15
Figure 3.9. Alternative 5 – Short Groin Cross Section and Profile	3-18
Figure 3.10. Typical Groin Cross Section (note that core stones are not proposed)	3-19
Figure 3.11. Alternative 6 – Beach Fill and Intermediate Terminal Groin Footprints	3-21
Figure 3.12. Alternative 6 – Intermediate Groin Cross Section and Profile	3-22
Figure 4.1. Biotic Communities within the Permit Area	4-2
Figure 4.2. Conceptual regional and local net sediment transport schematic at LFI (2004 aerial).....	4-6
Figure 4.3. Hardbottom Habitat near Permit Area	4-9
Figure 4.4. Potential Submerged Aquatic Vegetation in and near Permit Area	4-18
Figure 4.5. Intertidal and Subtidal Habitat in and Near the Permit Area.....	4-21
Figure 4.6. Area Considered for Designation as North Atlantic Right Whale Southeastern Calving Critical Habitat	4-25
Figure 4.7. Shorebird Critical Habitat, Sightings, and Nests in and near the Permit Area	4-30
Figure 4.8. Loggerhead Turtle Nesting near Permit Area (2005 - 2014).....	4-39
Figure 4.9. Loggerhead Turtle Nesting within Permit Area (2005 - 2014)	4-40
Figure 4.10. Loggerhead Turtle Critical Habitat in and near Permit Area.....	4-41
Figure 4.11. Seabeach Amaranth in the Permit Area in 2014. Inset is of seabeach amaranth located on East End of Holden Beach	4-50
Figure 4.12. Shipwrecks Located in LFI	4-53
Figure 4.13. Flood Zones on Holden Beach	4-66
Figure 5.1. Lockwoods Folly River Habitat Restoration Project, Phase I – Eastern Channel.....	5-2
Figure 5.2. Alternative 1 – Model-Projected Year 4 Shoreline Change.....	5-7

Figure 5.3. Alternative 2 – Model-Projected YR4 Shoreline Change	5-11
Figure 5.4. Holden Beach – Model-Projected YR4 MHW Lines for all Alternatives	5-13
Figure 5.5. Oak Island – Model-Projected YR4 MLW Lines for all Alternatives	5-15
Figure 5.6. Alternative 1 and 3 – Model-Projected YR4 Shoreline Change	5-16
Figure 5.7. Alternative 4 – Model-Projected YR4 Shoreline Change	5-17
Figure 5.8. Alternative 5 – Model-Projected YR4 Shoreline Change	5-18
Figure 5.9. Alternative 6 – Model-Projected YR4 Shoreline Change	5-19
Figure 5.10. Predicted YR0-YR4 Changes in East End Relative Beach Width (ft) Under Alternatives 1, 3, 4, 5, and 6	5-20
Figure 5.11. Oak Island – Model-Projected YR4 MHW Lines	5-24
Figure 5.12. Oak Island – Model-Projected YR4 MLW Lines	5-25
Figure 5.13. Alternative 2 – Model-Projected YR4 Habitat Changes	5-56
Figure 5.14. Alternative 2 – Projected Properties at Risk and Infrastructure Impacts at YR4 End.....	5-65
Figure 5.15. Alternative 3 – Model-Projected YR4 Habitat Changes	5-78
Figure 5.16. Alternative 3 – Projected Properties at Risk and Infrastructure Impacts at YR4 End.....	5-89
Figure 5.17. Alternative 4 – Model-Projected YR4 Habitat Changes	5-103
Figure 5.18. Alternative 4 – Projected Properties at Risk and Infrastructure Impacts at YR4 End.....	5-117
Figure 5.19. Alternative 5 - Typical Flood Tide Current Vector Diagram	5-125
Figure 5.20. Alternative 5 - Typical Ebb Tide Current Vector Diagram	5-126
Figure 5.21. Alternative 5 - Relative Particle Concentration.....	5-127
Figure 5.22. Alternative 5 – Model-Projected YR4 Habitat Changes	5-130
Figure 5.23. Alternative 5 – Projected Properties at Risk and Infrastructure Impacts at YR4 End.....	5-139
Figure 5.24. Alternative 6 - Typical Flood Tide Current Vector Diagram.....	5-146
Figure 5.25. Alternative 6 – Typical Ebb Tide Current Vector Diagram.....	5-147
Figure 5.26. Alternative 6 - Relative Particle Concentration.....	5-148
Figure 5.27. Alternative 6 – Model-Projected YR4 Habitat Change	5-150
Figure 5.28. Alternative 6 – Projected Properties at Risk and Infrastructure Impacts at YR4 End.....	5-157
Figure 6.1. Bird Monitoring Plan for the Lockwoods Folly River Habitat Restoration Project, Phase I – Eastern Channel.....	6-10

LIST OF PHOTOS

	Page
Photo 1.1. View of threatened home on the East End of Holden Beach	1-8
Photo 1.2. Close-up view of eroded dune on the East End of Holden Beach	1-8
Photo 1.3. Holden Beach East End dune restoration activities following Hurricane Hanna	1-11
Photo 2.1. View to the east of a USACE beneficial use placement project in 2014	2-6
Photo 2.2. View to the east of a USACE beneficial use placement project and dune restoration efforts in 2014.....	2-6
Photo 2.3. View of a USACE maintenance dredging event in the Lockwood Folly Inlet AIWW crossing in 2014.....	2-7
Photo 3.1. View of temporary containment berm during the 2014 beneficial use project on the East End.....	3-6
Photo 3.2. Equipment utilized during the 2014 beneficial use project on the East End.....	3-6
Photo 3.3. View of sidecast dredge, the Merritt, working within the outer bar channel of LFI.....	3-7
Photo 3.4. Garden City, SC, sheet-pile groin after construction during low tide	3-16
Photo 3.5. Hunting Island SC groin at low tide.	3-16
Photo 4.1. View of tidal marsh along Eastern Channel, Oak Island, NC.....	4-3
Photo 4.2. View to the north of Eastern Channel and LFI flood shoal system.....	4-3
Photo 4.3. Colonial waterbirds resting on the Oak Island western spit.	4-14
Photo 4.4. Exposed boilers of the Bendigo (left foreground) and the USACE dredge boat, Currituck, Site 0001LFI.....	4-54
Photo 5.1. The dredge Marion working in Eastern Channel, spring 2015.	5-9
Photo 5.2. Sand placement activities on the west end of Oak Island, spring 2015.	5-9

LIST OF ACRONYMS

°	Degree
µPa	Micropascal
AADT	Average Annual Daily Traffic
AC	Acres
AEC	Areas of Environmental Concern
AIWW	Atlantic Intracoastal Waterway
AL	Alabama
ASSRT	Atlantic Sturgeon Status Review Team
ATM	Applied Technology and Management, Inc.
BA	Biological Assessment
BCB	Brunswick County Beaches
BFE	Base Flood Elevation
BPART	Beach, Parks, Access and Recreation/Tourism Fund
C	Centigrade
C2	Category 2
CAMA	Coastal Area Management Act
CARO-COOPS	Carolinas Coastal Ocean Observing and Prediction System
CEQ	Council of Environmental Quality
CETAP	Cetacean and Turtle Assessment Program
CFR	Code of Federal Regulations
CIRP	Coastal Inlets Research Program
CM	Centimeter
CMP	Coastal Migratory Pelagics
CMS	Coastal Modeling System
COLREGS	International Regulations for Preventing Collisions at Sea
CRC	Coastal Resources Commission
CSDR	Coastal Storm Damage Reduction Project
CT	Connecticut
CWA	Clean Water Act
CY	Cubic Yards
CY/YR	Cubic Yards per Year
CZMA	Coastal Zone Management Act
dB	Decibels
DEIS	Draft Environmental Impact Statement
DON	Department of Navy
DPS	Distinct Population Segments
DWR	North Carolina Division of Water Resources
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EM	Engineering Manual
EPA	Environmental Protection Agency
ESA	Endangered Species Act
F	Fahrenheit
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency

FHWG	Fisheries Hydroacoustic Working Group
FIRM	Flood Insurance Rate Maps
FL	Florida
FR	Federal Register
FSC	Federal Species of Concern
FT	Feet
FWCC	Florida Fish and Wildlife Conservation Commission
GA	Georgia
GIS	Geographic Information System
GMI	Geo-Marine Inc.
GPS	Global Positioning System
GS	General Statute
HP	Horsepower
HQW	High Quality Waters
HZ	Hertz
IMP	Inlet Management Plan
IWC	International Whaling Commission
KHZ	Kilohertz
KM	Kilometers
KW	Kilowatt
LA	Louisiana
LFI	Lockwoods Folly Inlet
LFIX	Lockwoods Folly Inlet Crossing
M	Meters
MA	Massachusetts
MCY	Million Cubic Yard
mg/L	Milligrams/Liter
MGPD	Million Gallons Per Day
MHW	Mean High Water
MLW	Mean Low Water
MLLW	Mean Lower Low Water
MM	Millimeters
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement
MS	Mississippi
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSL	Mean Sea Level
N	North
NAI	Normandeau Associates, Inc.
NAVD	North American Vertical Datum
NC	North Carolina
NCAC	North Carolina Administrative Code
NCDAQ	North Carolina Division of Air Quality
NCDCM	North Carolina Division of Coastal Management
NCDENR	North Carolina Department of Environment and Natural Resources
NCDMF	North Carolina Division of Marine Fisheries
NCDOT	North Carolina Department of Transportation
NCDWQ	North Carolina Division of Water Quality
NCEPA	North Carolina Environmental Policy Act
NCFMP	North Carolina Flood Mapping Program

NCNHP	North Carolina Natural Heritage Program
NCWRC	North Carolina Wildlife Resource Commission
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NIMA	National Insurance and Mitigation Administration
NJ	New Jersey
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPS	Nonpoint Source
NRC	National Research Council
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Units
NY	New York
ORW	Outstanding Resource Waters
OSA	Office of State Archaeology
OSHA	Occupational Safety and Health Administration
PN	Public Notice
PNA	Primary Nursing Area
PPT	Parts Per Thousand
PRT	Project Review Team
RI	Rhode Island
RMS	Root-Mean-Square
SAFMC	South Atlantic Fisheries Management Council
SAV	Submerged Aquatic Vegetation
SC	South Carolina
SEAMAP-SA	Southeast Area Monitoring and Assessment Program
SEPA	State Environmental Policy Act
SHPO	State Historic Preservation Office
SMP	Sand Management Plan
SPL	Sound Pressure Level
SR	State Road
SST	Sea Surface Temperature
SSSRT	Shortnose Sturgeon Status Review Team
TAC	Technical Advisory Committee
TEWG	Turtle Expert Working Group
TSS	Total Suspended Solids
TX	Texas
US	United States
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VA	Virginia
W	West
WRDA	Water Resources Development Act