OCS EIS/EA
BOEM 2015-038

Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina

Revised Environmental Assessment

U.S. Department of the Interior
Bureau of Ocean Energy Management
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Published by

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September 2015

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FINDING OF NO SIGNIFICANT IMPACT

Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf (OCS) Offshore North Carolina

INTRODUCTION

The United States Department of the Interior (USDOI), Bureau of Ocean Energy Management (BOEM) prepared an environmental assessment (EA) to determine whether issuance of leases and approval of site assessment plans (SAPs) within areas identified offshore North Carolina would have a significant effect on the environment and whether an environmental impact statement (EIS) must be prepared. BOEM conducted its analysis to comply with the National Environmental Policy Act (NEPA), 42 United States Code (U.S.C.) §§ 4321-4370f, the Council on Environmental Quality (CEQ) regulations at 40 Code of Federal Regulations (CFR) 1501.3(b) and 1508.9, USDOI regulations implementing NEPA at 43 CFR 46, and USDOI Manual (DM) Chapter 15 (516 DM 15).

BOEM's environmental analysis was limited to the effects of lease issuance: site characterization (i.e., surveys of the lease areas and potential cable routes), and site assessment activities (i.e., construction and operation of meteorological towers and/or buoys on the leases to be issued) within three Wind Energy Areas (WEAs) offshore North Carolina. These areas were identified by BOEM in August 2014 as potentially suitable for commercial wind development based on input from the BOEM-lead North Carolina Intergovernmental Task Force (Task Force), comments on the *Notice of Intent to Prepare an Environmental Assessment* (77 FR 74218), comments on the *Commercial Leasing for Wind Power on the OCS Offshore North Carolina - Call for Information and Nominations* (77 FR 74204), and input received during public outreach efforts.

On January 23, 2015, BOEM published a *Notice of Availability for the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina Environmental Assessment* (80 FR 3621) (the "EA") for a 30-day comment period. BOEM hosted public meetings on February 9, 2015 in Kitty Hawk, North Carolina, February 11, 2015 in Wilmington, North Carolina, and February 12, 2015 in Carolina Shores, North Carolina. During these meetings, members of the public in attendance provided written and verbal comments on the EA. BOEM has revised the EA to address comments received during the public comment period and public meetings, and incorporate the results of consultations. Section 5.1.3 of the revised EA includes a summary of public comments and revisions to the EA. This finding is accompanied by and cites the revised EA.

PURPOSE AND NEED OF THE PROPOSED ACTION

The purpose of the proposed action is to issue leases and approve SAPs to provide for the responsible development of wind energy resources within three WEAs offshore North Carolina (Figure 1-5 in the attached revised EA). The need for BOEM issuance of leases and approval of

SAPs is to adequately assess wind and environmental resources of the WEAs to determine if areas within the WEAs are suitable for, and could support, commercial-scale wind energy production.

DESCRIPTION OF THE PROPOSED ACTION

The proposed action that is the subject of the revised EA is the issuance of commercial and research wind energy leases within the entirety of the three WEAs offshore North Carolina and approval of site assessment activities on those leaseholds. Alternative A analyzes issuing leases in the largest geographical area (i.e., all three WEAs). BOEM has identified Alternative A as the preferred alternative. In addition to the proposed action, BOEM considered three other alternatives, including no action (see Section 2 of the revised EA).

EA Summary

The revised EA considers the reasonably foreseeable environmental consequences associated with leasing, site characterization, and site assessment. In particular, the EA analyzed the environmental and socioeconomic impacts of surveys (including shallow hazards, geological, geotechnical, archeological, and biological), the installation, operation, and decommissioning of meteorological towers and/or buoys, vessel traffic, and onshore activities.

As part of the proposed action and alternatives, BOEM considered several Standard Operating Conditions (SOCs) to reduce or eliminate the potential environmental risks to or conflicts with individual environmental resources. These SOCs were developed through the analyses presented in Section 4 of the revised EA and through consultations with other federal agencies (see Section 5 of the revised EA). A brief summary of the SOCs are outlined below. If a lease or leases are issued within all or part of the WEAs, BOEM will require the lessee(s) to comply with the SOCs through lease stipulations and/or as conditions of SAP approval.

- Section 4.4.2.1 of the revised EA sets forth SOCs to minimize or eliminate potential impacts to avian species, including the use of red-flashing aviation obstruction lights, requiring the use of navigation lights that meet USCG private aids to navigation requirements (PATON) for shipping vessels, requiring that additional lights on towers only be used when necessary and be hooded downward, requiring that meteorological towers be designed to avoid using guy wires.
- BOEM’s May 2015 Finding of No Adverse Effect sets forth conditions for the purposes of meeting its obligations under Section 106 of the National Historic Preservation Act of 1966, as amended (54 U.S.C. 306108). These conditions include identification and avoidance measures that will be included in commercial leases issued within the North Carolina WEAs to ensure that the proposed undertaking will not affect historic properties (see Section 4.4.4.1 of the revised EA).
- Appendix B of the revised EA sets forth SOCs to minimize or eliminate potential impacts to marine mammals and sea turtles that resulted from BOEM’s Endangered Species Act (ESA) consultation with National Marine Fisheries Service (NMFS) (see Section 5.3 of the revised EA). These conditions include

vessel strike avoidance and marine debris awareness measures; protected species observers, exclusion and monitoring zones; sound source verification, ramp up, soft start and shutdown procedures; visibility, seasonal and frequency-dependent restrictions for various activities, as well as multiple reporting requirements.

- Sections 4.4.2.8 and 4.4.2.5 of the revised EA set forth SOCs to minimize or eliminate potential impacts to fish and essential fish habitat that resulted from BOEM's consultation with NMFS pursuant to Section 305(b) of the Magnuson-Steven Fishery Conservation and Management Act (see Section 5.3 of the revised EA). SOCs included soft start pile driving measures which will minimize the possibility of exposure to injurious sound levels by prompting any fish to leave the area prior to exposure to disturbing levels of sound.

ALTERNATIVES

BOEM considered the proposed action (Alternative A) and three alternatives. Alternative A, the preferred alternative, is the issuance of commercial and research wind energy leases within the entirety of the three WEAs offshore North Carolina and approval of site assessment activities on those leaseholds (see Section 2.1 of the revised EA). Alternative B (see Section 2.2 of the revised EA) would exclude the entire Wilmington West WEA from leasing and site assessment activities in order to reduce the potential for impacts on North Atlantic right whales. Alternative C (see Section 2.3 of the revised EA) would limit vessel activity by excluding high-resolution geological and geophysical surveys during peak migration of North Atlantic right whales (November 1 through April 30). Vessel traffic not associated with high-resolution geological and geophysical surveys (e.g., vessel-based and aerial avian, bat, marine mammal, sea turtle, and fish surveys) would not be restricted. Alternative C would still include the issuance of leases within the entirety of the three WEAs offshore North Carolina. Under Alternative D, the No Action Alternative (see Section 2.4 of the revised EA), no wind energy leases would be issued, and no site assessment activities would be approved within the WEAs offshore North Carolina. Although site characterization surveys are not under BOEM's jurisdiction and could still be conducted, these activities would not be likely to occur without the possibility of a commercial wind energy lease.

Alternative A is generally anticipated to have the greatest environmental consequences of the action alternatives. As a result, Alternative A is the focus of the environmental analysis in the EA, and is the alternative against which the lesser or equal impacts of the other alternatives are compared.

Environmental and Socioeconomic Consequences of Alternative A (Preferred Alternative): The Proposed Action

Alternative A presumes reasonably foreseeable scenarios for leasing, site characterization, and site assessment (Chapter 3). Alternative A contemplates leasing the maximum area of each WEA, resulting in up to three total leases. It should be noted that BOEM may not offer three leases. If BOEM elects to offer less than three leases the impacts related to the installation of meteorological towers and meteorological buoys would be proportionally less based on the number of leases offered.

Like the other action alternatives, Alternative A assumes that lessees would undertake the maximum amount of site characterization surveys (i.e., shallow hazards, geological, geotechnical, archaeological and biological surveys) in their leased areas, which, under Alternative A, would constitute the full area of each of the three WEAs. Under Alternative A, assuming that all lessees choose to install meteorological facilities, BOEM anticipates that up to three meteorological towers or six meteorological buoys, or some combination of meteorological towers and buoys, would be installed within the three WEAs. Site characterization, assessment, and biological survey activities are projected to result in a maximum of 1,927-1,999 round-trips by vessels over a five year period, which would be divided among major and smaller ports in Virginia, North Carolina, and South Carolina. Under Alternative A, as well as the other alternatives, BOEM would require lessees to comply with various requirements while conducting activities on their leases for the purpose of ensuring that potential impacts to the environment are avoided or minimized. These requirements are referred to as SOCs and will be implemented through lease stipulations and/or as conditions of approval of a SAP.

The reasonably foreseeable impacts of Alternative A (the preferred alternative) on environmental resources and socioeconomic conditions are described in detail in Section 4.4 of the revised EA: air quality (Section 4.4.1.1); water quality (Section 4.4.1.2); birds (Section 4.4.2.1); bats (Section 4.4.2.2); benthic resources (Section 4.4.2.3); coastal habitats (Section 4.4.2.4); marine mammals (Section 4.4.2.5); sea turtles (Section 4.4.2.6); finfish and essential fish habitat (Section 4.4.2.7); federally listed fish species (Section 4.4.2.8); land use and coastal infrastructure (Section 4.4.3); cultural, historical, and archaeological resources (Section 4.4.4.1); demographics and employment (Section 4.4.4.2); environmental justice (Section 4.4.4.3); recreation and tourism (Section 4.4.4.4); commercial and recreational fisheries (Section 4.4.4.5); and visual resources (Section 4.4.4.6).

The impact levels BOEM applied throughout the revised EA are derived by BOEM from a four-level classification scheme used to characterize the predicted impacts if the proposal is implemented and activities occur as described. This classification scheme is defined in the *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf* (MMS, 2007). For most resources analyzed in the revised EA, the reasonably foreseeable impacts for the proposed action described in the EA range from negligible to minor. Potential moderate impacts would be limited to marine mammals and sea turtles and would only result from noise generated during pile driving activities. This noise would only occur during the installation of meteorological towers, and result in moderate, but temporary, impacts.

BOEM's SOCs were developed to minimize or eliminate potential impacts to protected species including ESA-listed species of marine mammals and sea turtles. These SOCs were developed through the analyses presented in Section 4.4 of the EA and through consultation with other federal and state agencies. This EA considers the SOCs to be part of the proposed action. No population effects are anticipated by BOEM and no critical habitat would be affected by the proposed action, because highly mobile species would leave the affected area. If BOEM receives a SAP that includes pile driving activities (i.e. installation of a meteorological tower), BOEM would consult with NMFS under Section 7 of the ESA (see BOEM letter to NMFS regarding consultation for the proposed action and NMFS concurrence letter in Appendix E in the revised EA).

The incremental impact of the proposed action, when added to other past, present, and reasonably foreseeable actions that may affect the environment, would be negligible to moderate (see Section 4.8 of the revised EA). Moreover, the proposed action would facilitate the gathering of information related to seafloor conditions, biological data, and wind speeds necessary to successfully determine the feasibility of the proposed lease areas for commercial wind energy development.

BOEM placed heavy weight on public and stakeholder comments, consultations, and information received through BOEM's outreach efforts. BOEM finds that the issuance of commercial and research wind energy leases within the three WEAs offshore North Carolina and subsequent site characterization and site assessment activities would have no significant impact on the environment. As a result, the preparation of an EIS is not necessary for BOEM to issue commercial and research wind energy leases in the three WEAs offshore North Carolina and approve site assessment activities on those leaseholds.

SUPPORTING DOCUMENTS

The following documents support this finding of no significant impact and are available upon request or at www.boem.gov/:

- BOEM's research and review of current scientific and socioeconomic literature;
- Public response to the December 13, 2012, Notice of Intent to prepare this EA;
- Comments received in response to the Call for Information and Nominations issued on December 13, 2012, associated with wind energy planning offshore North Carolina;
- Public response to the January 23, 2015, Notice of Availability of an EA;
- Consultation and coordination with the members of BOEM's North Carolina Intergovernmental Renewable Task Force;
- Consultation with other federal agencies including the U.S. Fish and Wildlife Service, NMFS, U.S. Department of Defense, and U.S. Coast Guard;
- Relevant material from the *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternative Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement* (MMS, 2007);
- Relevant material from *Coastal Wind Energy for North Carolina's Future: A Study of the Feasibility of Wind Turbines in the Pamlico and Albemarle Sounds and in Ocean Waters Off the North Carolina Coast* (UNC, 2009);
- Relevant material from *Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts* (BOEM, 2014f);
- Relevant material from *Fishing, Diving, and Ecotourism Stakeholder Uses and Habitat Information for North Carolina Wind Energy Call Areas* (BOEM, 2013a); and
- Relevant material from the *Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas Final Programmatic Environmental Impact Statement* (BOEM, 2014a).

CONCLUSION

I have thoroughly considered the issues and concerns identified in the revised EA and by the public and cooperating and consulting agencies in their comments; the evaluation of the potential effects of the proposed action and alternatives in the attached, revised EA; and the 40 CFR 1508.27 significance factors. It is my determination that there are no substantial questions regarding the reasonably foreseeable impacts of the proposed action or alternatives, and that no reasonably foreseeable significant impacts are expected to occur as the result of the preferred alternative or any of the alternatives contemplated in the revised EA. It is therefore my determination that implementing the proposed action or any of the alternatives would not constitute a major federal action significantly affecting the quality of the human environment under Section 102(2)(C) of the National Environmental Policy Act of 1969. As a result, an EIS is not required, and I am issuing this finding of no significant impact.

Michelle Morin — 09/03/15

Michelle Morin
Chief, Environment Branch for Renewable Energy
Office of Renewable Energy Programs

Date

TABLE OF CONTENTS

Appendices

LIST OF TABLES

LIST OF FIGURES

ACRONYMS, ABBREVIATIONS, AND SYMBOLS

°C	degrees Celsius
μPa	micropascal
μs	microsecond
ACHP	Advisory Council on Historic Preservation
ADCP	Acoustic Doppler Current Profiler
AIS	Automatic Identification System
AIW	Atlantic Intracoastal Waterway
APPS	Act to Prevent Pollution from Ships
B.P.	before present
BA	Biological Assessment
BO	Biological Opinion
BOEM	Bureau of Ocean Energy Management
Call	Call for Information and Nominations
Caltrans	California Department of Transportation
CD	Consistency Determination
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CHIRP	Compressed High Intensity Radar Pulse
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CODAR	coastal ocean dynamic applications radar
COLOS	Coastal Oceanographic Line-of-Sight
COP	Construction and Operation Plan
Corridor	Gullah/Geechee Cultural Heritage Corridor
CPT	cone penetration test
cSEL	cumulative sound exposure level
dB	decibel
dB re 1 μPa at 1 m	source level, received level measured or estimated 3 feet (1 meter) from the source
dB_{peak}	peak decibels
DCC	data collection configuration
DMA	Dynamic Management Area
DOD	U.S. Department of Defense
EA	Environmental Assessment
EDR	Environmental Design & Research, Landscape Architecture, Engineering, & Environmental Services, D.P.C.
EFH	Essential Fish Habitat
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
Finding	Finding of No Historic Properties Affected for the undertaking of issuing commercial leases within the North Carolina WEAs
FONSI	Finding of No Significant Impact

FR	*Federal Register*
G&G	geological and geophysical
G&G Final PEIS	*Atlantic OCS Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas: Final Programmatic Environmental Impact Statement*
G&G PBA	*Atlantic OCS Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas: Final Programmatic Environmental Impact Statement* Programmatic Biological Assessment
GHG	greenhouse gas
HAPC	Habitat Area of Particular Concern
HF	high frequency
HRG	high-resolution geophysical
Hz	hertz
IBA	important bird area
IPC	impact-producing factor
kHz	kilohertz
kJ	kilojoule
km	kilometer
km^2	square kilometer
LiDAR	Light Detection and Ranging
MAB	Mid-Atlantic Bight
MARAD	Maritime Administration
MARPOL	International Convention for the Prevention of Pollution from Ships
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MOU	Memorandum of Understanding
ms	Millisecond
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSL	mean sea level
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAB	Naval Amphibious Base
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
NC	North Carolina
NC Task Force	BOEM Intergovernmental North Carolina Renewable Energy Task Force
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
nm	nautical mile
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOMADS	Naval Oceanographic and Meteorological Automated Devices
NO_X	nitrogen oxides

NPS	National Park Service
NRHP	National Register of Historic Places
NWP	Nationwide Permit
NWR	National Wildlife Refuge
NWS	Naval Weapons Station
O&M	Operations and Maintenance
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OPAREA	operating area
PCE	primary constituent element
PEIS	*Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement*
PM10	particulate matter with aerodynamic diameters of 10 microns or less
PM2.5	particulate matter with aerodynamic diameters of 2.5 microns or less
PSO	Protected-Species Observer
RMS	root mean square
ROV	remotely operated underwater vehicle
SAB	South-Atlantic Bight
SAFMC	South Atlantic Fishery Management Council
SAP	Site Assessment Plan
SC	South Carolina
SHPO	State Historic Preservation Office
SMZ	Special Management Zone
SOC	Standard Operating Condition
SODAR	Sonic Detection and Ranging
SO_X	sulfur oxides
SPI	sediment-profile imaging
SPL	sound pressure level
SST	sea surface temperature
TSS	Traffic Separation Scheme
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
VA	Virginia
Vision plan	*25-Year Vision for North Carolina: Mapping our Future*
VOC	volatile organic compound
WEA	Wind Energy Area

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1. INTRODUCTION

1.1 Background

1.1.1 BOEM Authority and Regulatory Process

The Energy Policy Act of 2005, Pub. L. No. 109-58, added Section 8(p)(1)(C) to the Outer Continental Shelf Lands Act (OCSLA), which authorized the Secretary of the Interior to issue leases, easements, or rights-of-way on the Outer Continental Shelf (OCS) for the purpose of wind energy development (see 43 United States Code [U.S.C.] § 1337(p)(1)(C)). The Secretary of the Interior delegated this authority to the former Minerals Management Service (MMS), now the Bureau of Ocean Energy Management (BOEM). Final regulations implementing this authority at Title 30 of Code of Federal Regulations (CFR) 585 were promulgated on April 22, 2009.

Under the renewable energy regulations, the issuance of leases and subsequent approval of wind energy development on the OCS is a staged decision-making process. BOEM's wind energy program occurs in four distinct phases, as described below.

1. *Planning and Analysis.* The first phase is to identify suitable areas to be considered for wind energy project leases through collaborative, consultative, and analytical processes, including using the BOEM Intergovernmental Renewable Energy Task Force (hereinafter NC Task Force), public information meetings, and input from the states and other stakeholders.
2. *Lease Issuance.* The second phase, issuance of a commercial wind energy lease, gives the lessee the exclusive right to subsequently seek BOEM approval for the development of the leasehold. The lease does not grant the lessee the right to construct any facilities; rather, the lease grants the right to use the leased area to develop its plans, which must be approved by BOEM before the lessee can move on to the next stage of the process (see 30 CFR 585.600 and 585.601).
3. *Approval of a Site Assessment Plan (SAP).* The third stage of the process is the submission of a SAP, which contains the lessee's detailed proposal for the construction of a meteorological tower, installation of meteorological buoys, or a combination of the two on the leasehold. BOEM's approval of a SAP allows the lessee to install and operate site assessment facilities for a specified term. The lessee's SAP must be approved by BOEM before it conducts these "site assessment" activities on the leasehold. BOEM may approve, approve with modification, or disapprove a lessee's SAP (see 30 CFR 585.605–585.618).
4. *Approval of a Construction and Operation Plan (COP).* The fourth stage of the process is the submission of a COP, a detailed plan for the construction and operation of a wind energy project on the lease. BOEM's approval of a COP allows the lessee to construct and operate wind turbine generators and associated facilities for a specified term. BOEM approval of a COP is a precondition to the construction of any wind energy facility on the OCS. As with a SAP, BOEM may approve, approve with modification, or disapprove a lessee's COP (see 30 CFR 585.620–585.638).

The U.S. Department of the Interior, BOEM, has prepared this environmental assessment (EA) to determine whether the issuance of leases and approval of SAPs within three Wind Energy Areas (WEAs) offshore North Carolina would lead to reasonably foreseeable significant impacts on the environment and whether an environmental impact statement (EIS) should thereby be prepared before leases are issued.

The regulations also require that a lessee provide the results of shallow hazard, geological, geotechnical, biological, and archaeological surveys with its SAP or COP. BOEM refers to these surveys as "site characterization" activities. Although BOEM does not issue permits for these site characterization activities, BOEM regulations require that a lessee include the results of these surveys in its application for SAP or COP approval (see 30 CFR 585.610(b) and 30 CFR 626 (a)).

Should a particular area be leased, and should the lessee subsequently submit a SAP, BOEM would then determine whether this EA adequately considers the environmental consequences of the activities proposed in the lessee's SAP. If BOEM determines that the analysis in this EA adequately considers these consequences, then no further National Environmental Policy Act (NEPA) analysis would be required before the SAP is approved. If, on the other hand, BOEM determines that the analysis in the EA is inadequate for that purpose, BOEM would prepare an additional NEPA analysis before approving the SAP.

If and when a lessee is prepared to propose wind energy generation on its lease, it will submit a COP. If a COP is submitted, BOEM would prepare a project-specific NEPA analysis. This would most likely take the form of an EIS and would provide additional opportunities for public involvement pursuant to NEPA and the Council on Environmental Quality (CEQ) regulations at 40 CFR 1500–1508. BOEM will use the EIS document to evaluate the reasonably foreseeable environmental consequences associated with the proposed COP activities. BOEM will use the EIS to decide whether to approve, approve with modification, or disapprove a lessee's COP pursuant to 30 CFR 585.628.

1.2 Purpose and Need

The purpose of the proposed action is to issue leases and approve SAPs to provide for the responsible development of wind energy resources within three WEAs offshore North Carolina. The need for BOEM issuance of leases and approval of SAPs is to adequately assess wind and environmental resources of the WEA to determine if areas within the WEA are suitable for, and could support, commercial-scale wind energy production.

1.3 Description of the Proposed Action

The proposed action is the issuance of commercial and research wind energy leases within the WEAs offshore North Carolina and approval of site assessment activities on those leases. Of the alternatives considered in this EA, Alternative A, the proposed action, would result in lease issuance over the largest geographic area. Two other action alternatives and a no-action alternative are also considered in this EA. All alternatives are described in Section 2.

1.4 Objective of the Environmental Assessment

Pursuant to NEPA, 42 U.S.C. §§ 4321–4370f, as well as the CEQ regulations at 40 CFR 1501.3, this EA was prepared to assist the agency in determining which OCS areas offshore North Carolina should be the focus of BOEM's wind energy leasing efforts. A number of reasonable geographic and non-geographic alternatives are considered, and the environmental and socioeconomic consequences, including potential user conflicts, associated with issuing leases and approving SAPs under each alternative are evaluated. This EA only considers whether issuing leases and approving site assessment activities in the WEAs offshore of North Carolina would lead to reasonably foreseeable significant impacts on the human environment and, thus, whether an EIS should be prepared before leases are issued.

1.4.1 Information Considered

Information considered in scoping this EA includes:

- Public response to the December 13, 2012, Notice of Intent (NOI) to prepare this EA;
- Comments received in response to the Call for Information and Nominations (Call) issued on December 13, 2012, associated with wind energy planning offshore North Carolina;
- Public response to the January 23, 2015, Notice of Availability (NOA) of an EA;
- Ongoing consultation and coordination with the members of BOEM's NC Task Force;
- Ongoing or completed consultations with other federal agencies, including the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), the U.S. Department of Defense (DOD), and the U.S. Coast Guard (USCG);
- Research and review of current relevant scientific and socioeconomic literature;
- *Atlantic OCS Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas: Final Programmatic Environmental Impact Statement*, February 2014 (G&G Final PEIS) (BOEM, 2014a);
- *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement* (PEIS) (MMS, 2007a);
- Biological Assessment for Commercial Wind Lease Issuance, Associated Site *Characterization Activities, and Subsequent Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia*, (BOEM, 2011a)
- *Literature Synthesis for the North and Central Atlantic Ocean, OCS Study BOEMRE 2011–2012* (BOEM, 2011b);
- Relevant material from the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia Final Environmental Assessment* (BOEM, 2012b);

- Relevant material from the *Project Plan for the Installation, Operation, and Maintenance of Buoy Based Environmental Monitoring Systems OCS Block 6931, New Jersey* (Fishermen's Energy, 2011);
- Relevant material from the *Issuance of Leases for Wind Resource Data Collection on the Outer Continental Shelf Offshore Delaware and New Jersey* (MMS, 2009a);
- *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts Revised Environmental Assessment* (BOEM, 2013e);
- *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Revised Environmental Assessment* (BOEM, 2014f);
- Relevant material from *Coastal Wind Energy for North Carolina's Future: A Study of the Feasibility of Wind Turbines in the Pamlico and Albemarle Sounds and in Ocean Waters Off the North Carolina Coast* (UNC, 2009); and
- *Fishing, Diving, and Ecotourism Stakeholder Uses and Habitat Information for North Carolina Wind Energy Call Areas* (BOEM, 2013a).

1.4.2 Scope of Analysis

This analysis is limited to the effects of lease issuance, site characterization activities (i.e., surveys of the lease area), and site assessment activities (i.e., construction and operation of meteorological towers/buoys) within the WEAs. This analysis complies with NEPA, Title 42 of U.S.C. §§ 4321–4370f and the CEQ regulations at 40 CFR 1501.3. This analysis does not consider construction and operation of any wind power facilities, which would be considered later in the process through project-specific evaluations. Therefore, this EA will analyze two distinct BOEM actions in the WEAs—lease issuance and SAP approval—and the reasonably foreseeable consequences associated with the following actions:

a. Conducting shallow hazard, geological, geotechnical, biological, and archaeological resource surveys.

b. Installing, operating, and decommissioning meteorological towers, meteorological buoys, or a combination of the two.

1.5 Supporting NEPA Evaluations

BOEM has conducted several other environmental analyses that will be used to inform this EA (listed below), consistent with the CEQ directive:

> *Sec. 1502.21, Incorporation by Reference.* Agencies shall incorporate material into an environmental impact statement by reference when the effect will be to cut down on bulk without impeding agency and public review of the action. The incorporated material shall be cited in the statement and its content briefly described. No material may be incorporated by reference unless it is reasonably available for inspection by potentially interested persons within the time allowed

for comment. Material based on proprietary data which is itself not available for review and comment shall not be incorporated by reference.

The G&G Final PEIS (BOEM, 2014a) includes a programmatic analysis of some of the same activities that are also part of the commercial wind lease issuance and site assessment activities considered in this EA. The affected environment and environmental consequences of these actions were analyzed in the same locations where all alternatives considered in this EA would occur. Geological and geophysical (G&G) survey activities for three program areas (oil and gas, renewable energy, and marine minerals) during the 2012–2020 time period were evaluated in the G&G Final PEIS (BOEM, 2014a). Alternative C (which was the No Action alternative and assumed that alternative energy development would continue on a project-by-project basis) in the G&G Final PEIS (BOEM, 2014a) included the same site characterization activities undertaken as part of renewable energy development that are evaluated in this EA for areas offshore North Carolina. These activities include:

- high-resolution geophysical surveys;
- geotechnical/sub-bottom sampling; and
- biological resource surveys using vessel and/or aerial surveys to characterize the WEAs for: (1) benthic habitats; (2) avian resources; and (3) marine fauna (it should be noted that bat surveys were not covered in the G&G Final PEIS [BOEM, 2014a] but have been analyzed in this EA).

The G&G Final PEIS (BOEM, 2014a) does not consider the construction, operation, and decommissioning of meteorological towers, which are included in the proposed action of this EA. Pursuant to CEQ guidance, this EA references information, analyses, and conclusions contained in the G&G Final PEIS (BOEM, 2014a), which is available at http://www.boem.gov/Atlantic-G-G-PEIS/#FinalPEIS.

BOEM has also prepared five other EAs that evaluated the same site characterization and site assessment activities considered in this EA, but in other geographic areas of the OCS. EAs have been prepared for activities offshore the states of:

1. New Jersey, Delaware, Maryland, and Virginia, available at http://www.boem.gov/uploadedFiles/BOEM/Renewable_Energy_Program/Smart_from_the_Start/Mid-Atlantic_Final_EA_012012.pdf and http://www.boem.gov/uploadedFiles/FinalEA_MMS2009-025_IP_DE_NJ_EA.pdf
2. Rhode Island and Massachusetts, available at http://www.boem.gov/uploadedFiles/BOEM/Renewable_Energy_Program/State_Activities/BOEM%20RI_MA_Revised%20EA_22May2013.pdf
3. Massachusetts, available at http://www.boem.gov/Revised-MA-EA-2014/
4. Georgia, available at http://www.boem.gov/2014-017/

These EAs are also incorporated by reference in this EA for activities offshore North Carolina.

1.6 Development of North Carolina Wind Energy Areas

1.6.1 Planning Process

1.6.1.1 North Carolina Wind Energy Area Identification Planning

BOEM delineated the WEAs through extensive collaboration and consultation with the NC Task Force, federal agencies, the general public, and other stakeholders. The NC Task Force is made up of state and local elected officials as well as officials from various federal agencies. BOEM held a public meeting to discuss wind facility development in North Carolina in August 2010. The NC Task Force held meetings in North Carolina in January, May, and October 2011 and in August 2012. Through this process, the three WEAs were identified: Kitty Hawk, Wilmington East, and Wilmington West. Figure 1-1 illustrates the extent of collaboration with stakeholders and the public over time.

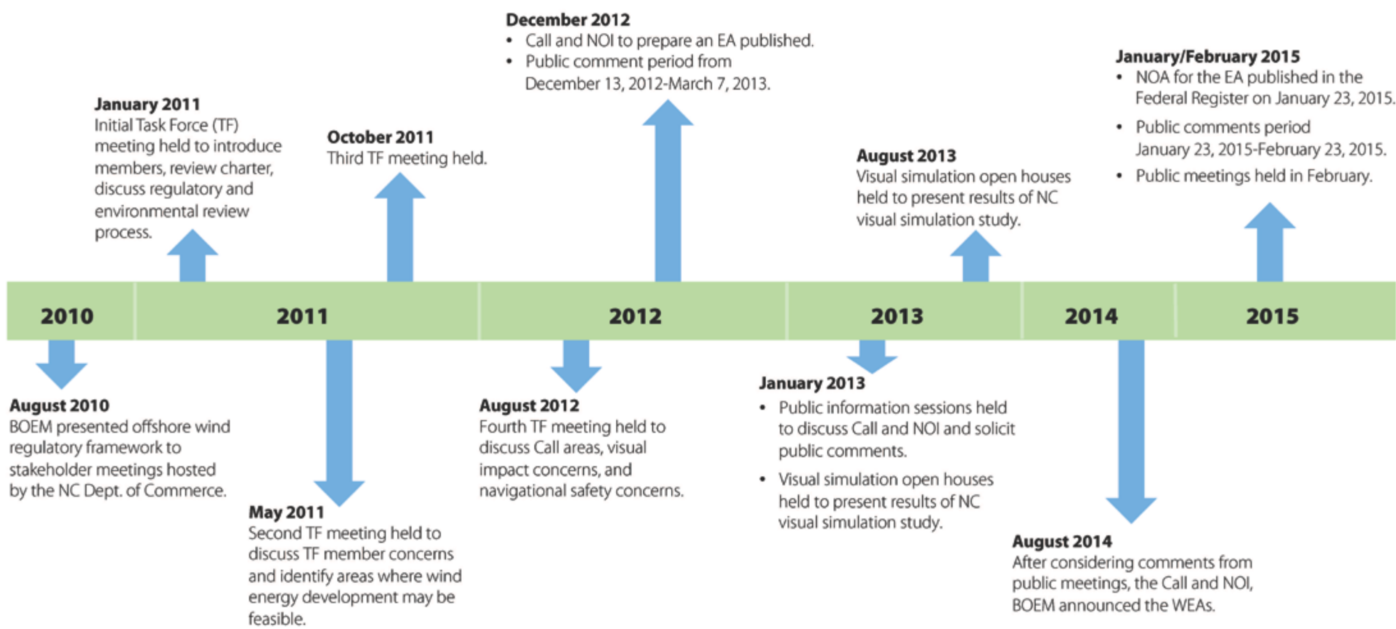

Figure 1-1 Wind Energy Area Identification Planning Timeline

The initial wind energy planning area that BOEM discussed with the NC Task Force was essentially the entire North Carolina coast. The initial planning area was bounded by the Virginia border to the north, the South Carolina border to the south, the federal/state water boundary to the west, and the 50-meter bathometric line and a maximum of 50 miles from shore to the east. Federal waters offshore North Carolina begin at 3 nautical miles (nm) from the coast, and the 50-meter bathometric line and the 50 miles from shore limit were chosen because of the limitations of traditional offshore wind technology. Figure 1-2 illustrates the initial planning area.

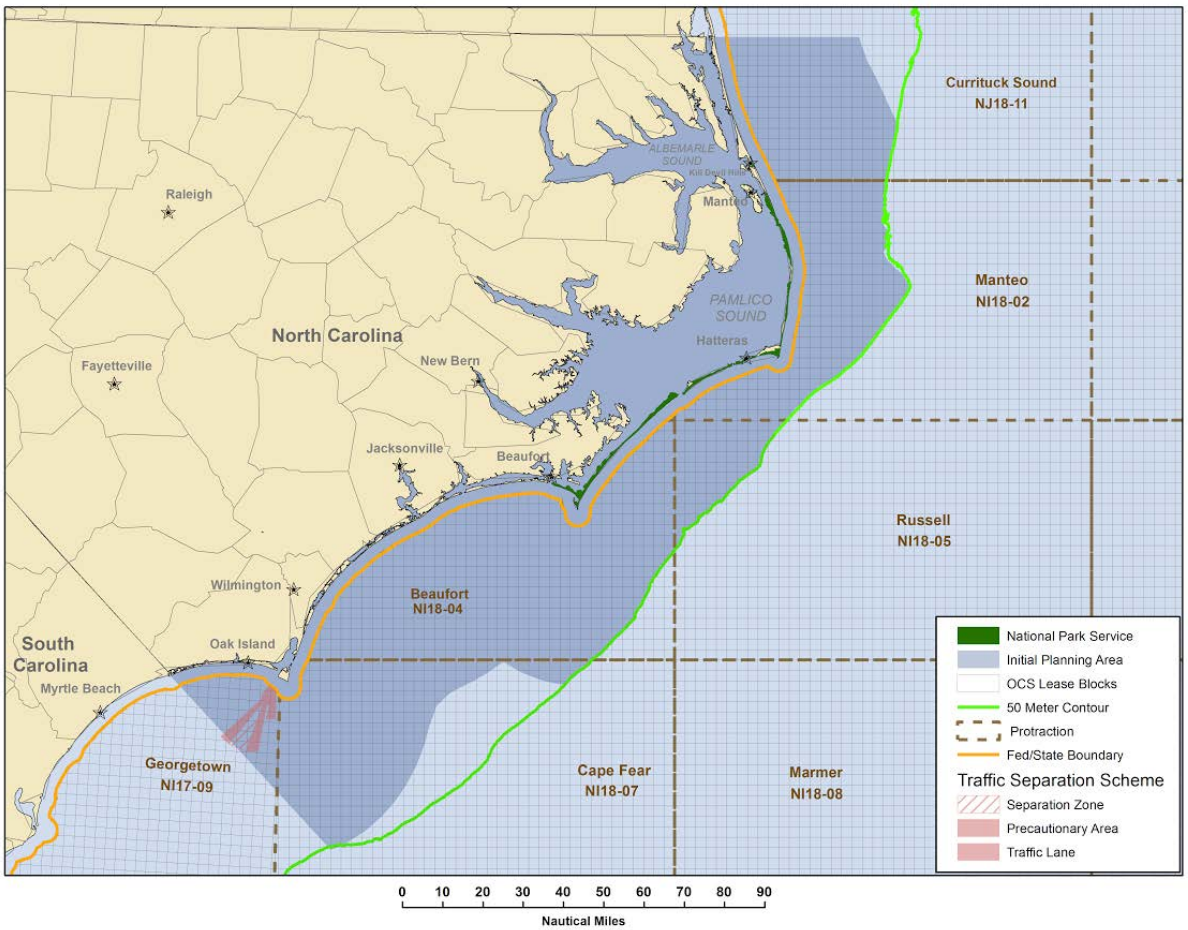

Figure 1-2 Initial Planning Area Offshore North Carolina

Fish habitat and fisheries conflict areas were identified and removed from the planning area. In addition, areas with high concentrations of bird and bird habitat were identified and removed from the planning area. This removed areas around the "capes," which demonstrated high levels of conflict with fish and bird species. Foundation suitability was analyzed, and areas with no to low potential for monopole or gravity base foundations were removed from the planning areas. Finally, BOEM worked with DOD to identify areas with military use conflicts. These areas were then removed from further leasing consideration. The result was five areas to be considered for wind energy development. Figure 1-3 illustrates the five areas remaining after areas were removed from the initial wind planning area.

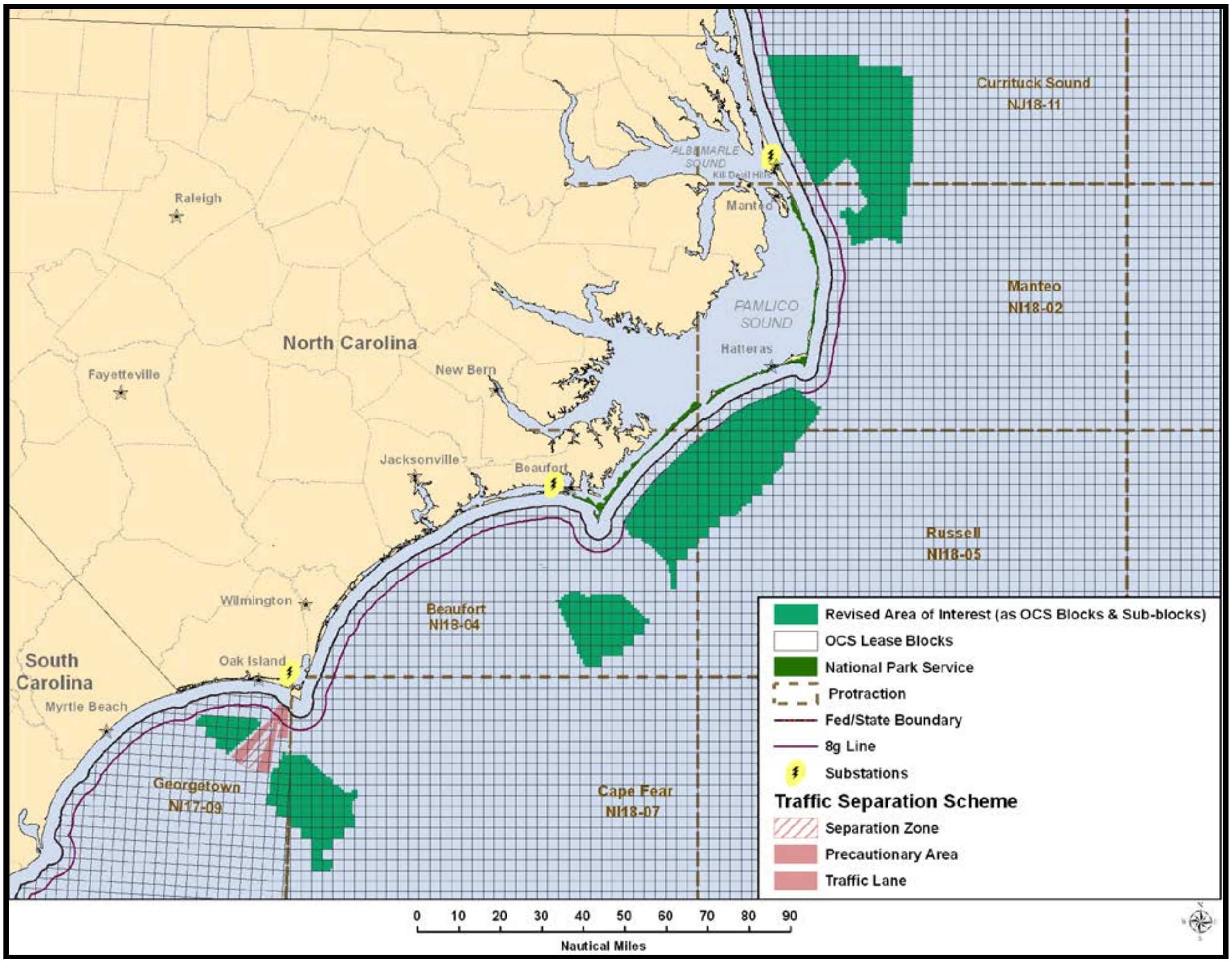

Figure 1-3 Five BOEM Planning Areas Offshore North Carolina

Because of concerns raised by the National Park Service (NPS), planning areas 3 and 4 were not included in the Call because of potential conflicts with the Cape Hatteras and Cape Lookout National Seashores. Although these areas were not included in the current round of leasing consideration, they may be considered in the future.

The NOI to prepare an EA for commercial wind leasing and site assessment activities offshore North Carolina was published in the *Federal Register* (FR) on December 13, 2012 (77 FR 74218). BOEM held public information sessions in North Carolina to solicit public comment and discuss the next steps in the environmental, planning, and leasing process. The meetings were held on January 7, 2013, in Nags Head, NC, and on January 9, 2013, in Wilmington, NC. Additionally, open houses to present visual simulations of example wind facilities within the Call areas were held in Kill Devil Hills, NC, on January 8, 2013; Wilmington, NC, on January 10, 2013; Southport, NC, on August 12, 2013; and Carolina Shores, NC, on August 14, 2013.

A Call (77 FR 74204) was also published in the FR on December 13, 2012. Anyone interested in acquiring a lease in the WEAs can respond to the Call, including the identification of the specific block or blocks the applicant is interested in acquiring and a general description of the applicant's objectives and the facilities that it contemplates using to achieve them. Figure 1-4 illustrates the areas included in the Call.

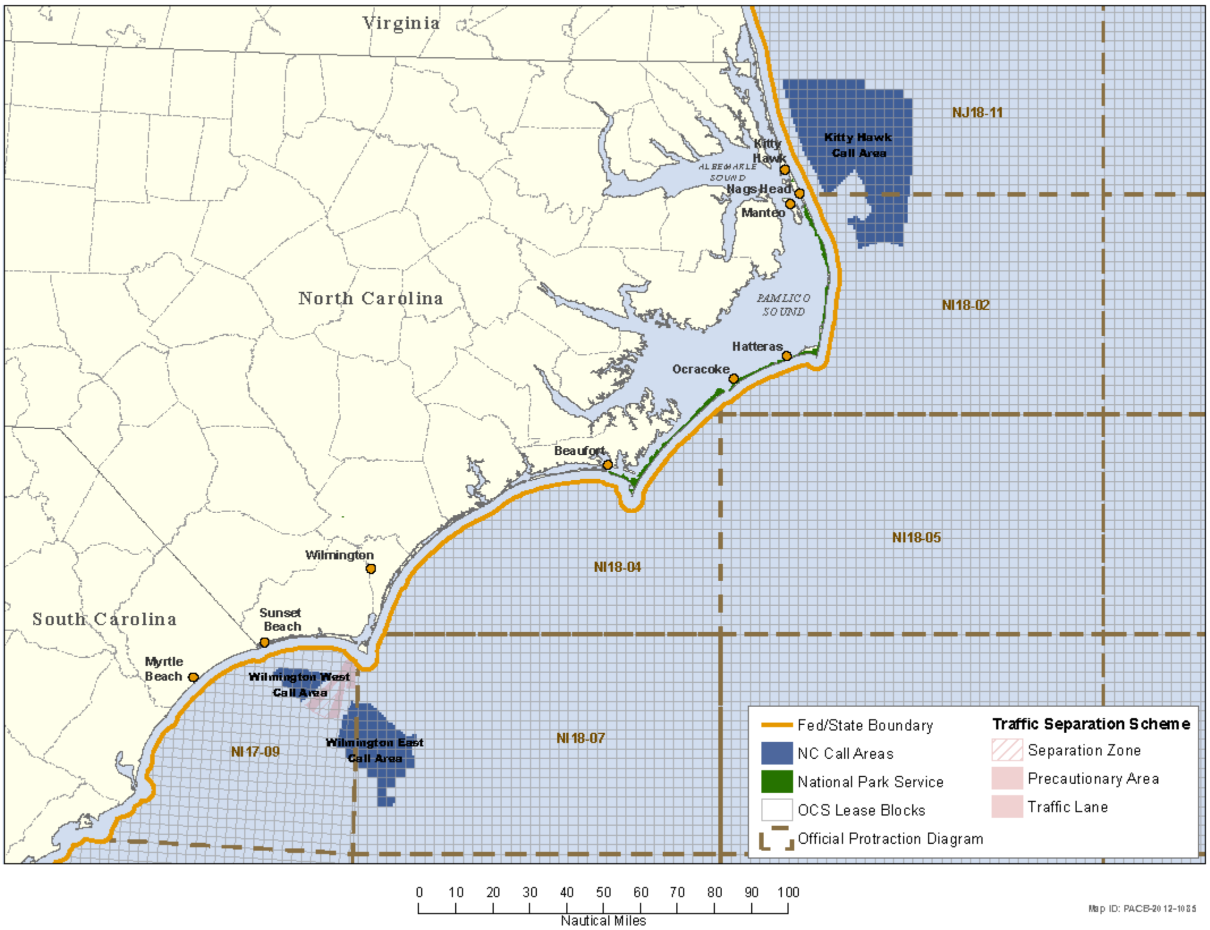

Figure 1-4 North Carolina Call Areas

Comments on the Call, NOI, and BOEM studies identified space use conflicts within the Call areas. BOEM worked closely with federal, state, local, and industry stakeholders to avoid existing high-use and sensitive resource areas while maximizing areas for offshore wind development. On August 7, 2014, BOEM released the Announcement of Area Identification (Appendix A), which reduced the original size of Call Area Kitty Hawk because of navigation safety concerns and proximity to the historic Bodie Island Lighthouse, Call Area Wilmington West because of visual concerns, and Call Area Wilmington East due to navigational safety concerns and the presence of hard-bottom habitat. Figure 1-5 depicts all three WEAs. BOEM worked closely with USCG and the maritime community to modify Call areas Kitty Hawk and Wilmington East because certain areas overlapped with traditional shipping routes used by both tugs and barges and deep-draft (primarily container ships) vessels that could present potential navigation and safety issues. In addition, NPS requested that areas within 33.7 nm of Bodie Island Lighthouse be excluded from development, and the town of Kitty Hawk passed a resolution requesting that BOEM exclude areas within 20 nm of the coast from development. In response to these concerns, areas within 33.7 nm of Bodie Island Lighthouse and 24 nm of the closest point to the coastline have been excluded from inclusion in the Kitty Hawk WEA.

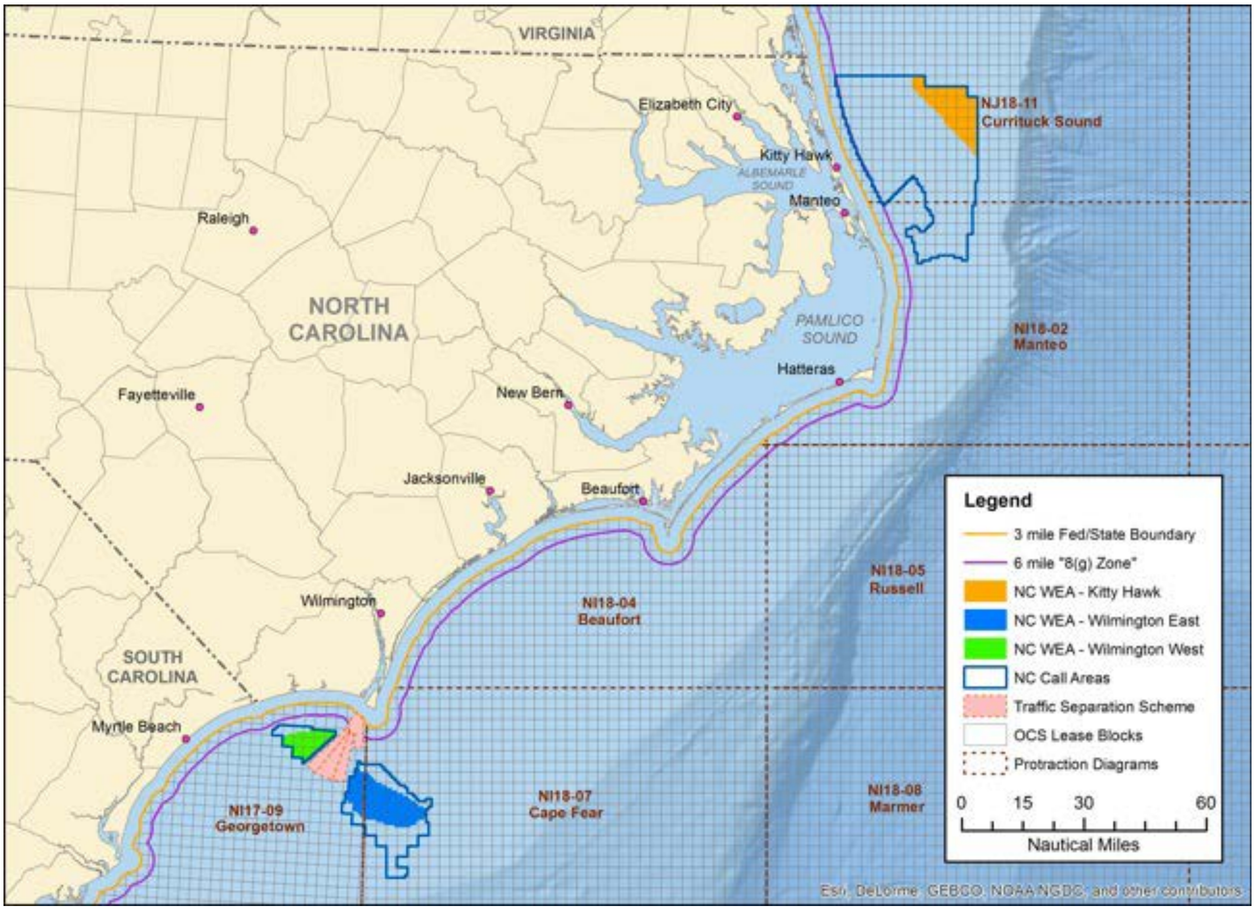

Figure 1-5 North Carolina WEAs

Areas within 10 nm of the coastline have not been included as part of the Wilmington West WEA in an effort to reduce visual impacts, even though portions of lease blocks included in the WEA are within 10 nm of shore. BOEM will not allow the installation of turbines within those areas. BOEM has worked closely with USCG and the maritime community to modify Call Area Wilmington East in an effort to minimize impacts on vessels that use the Port of Wilmington and traverse the North Carolina coast while still allowing for offshore wind development. In response to navigational safety concerns, BOEM excluded these areas from inclusion in the Wilmington

East WEA. Draft findings from a cooperative agreement with the University of North Carolina at Chapel Hill and interagency agreement with the National Oceanic and Atmospheric Administration (NOAA) also identified the majority of the excluded areas as containing high topographic relief and patches of consolidated hard bottom, both of which were found to be correlated with high fish densities.

The Kitty Hawk WEA begins about 24 nm from shore and extends approximately 25.7 nm in a general southeasterly direction at its widest point. Its seaward extent ranges from 13.5 nm in the north to 0.6 nm in the south. It contains approximately 21.5 OCS blocks (122,405 acres). The Wilmington West WEA begins about 10 nm from shore and extends approximately 12.3 nm in an east/west direction at its widest point. It contains just over nine OCS blocks (approximately 51,595 acres). The Wilmington East WEA begins about 15 nm from Bald Head Island at its closest point and extends approximately 18 nm in a southeasterly direction at its widest point. It contains approximately 25 OCS blocks (133,590 acres). All three WEAs will be considered for leasing and approval of site assessment plans as the proposed action under NEPA (42 U.S.C. §§ 4321–4370f).

Figure 1-6 depicts the process BOEM undertakes to analyze and make determinations related to WEAs. BOEM is not considering, and the EA will not support, any decisions for the construction and operation of wind energy facilities on leases that will potentially be issued in these WEAs. If, after leases are issued, a lessee proposes to construct a commercial wind energy facility, it would submit a COP. If and when BOEM receives such a plan, it would prepare a site-specific NEPA document for the project proposed, which would include the lessee's proposed transmission line(s) to shore. These cable routes would underlie areas outside of the WEAs and may include areas beneath the areas with conflicts from vessel traffic, visual impacts, hard bottom, and fishing.

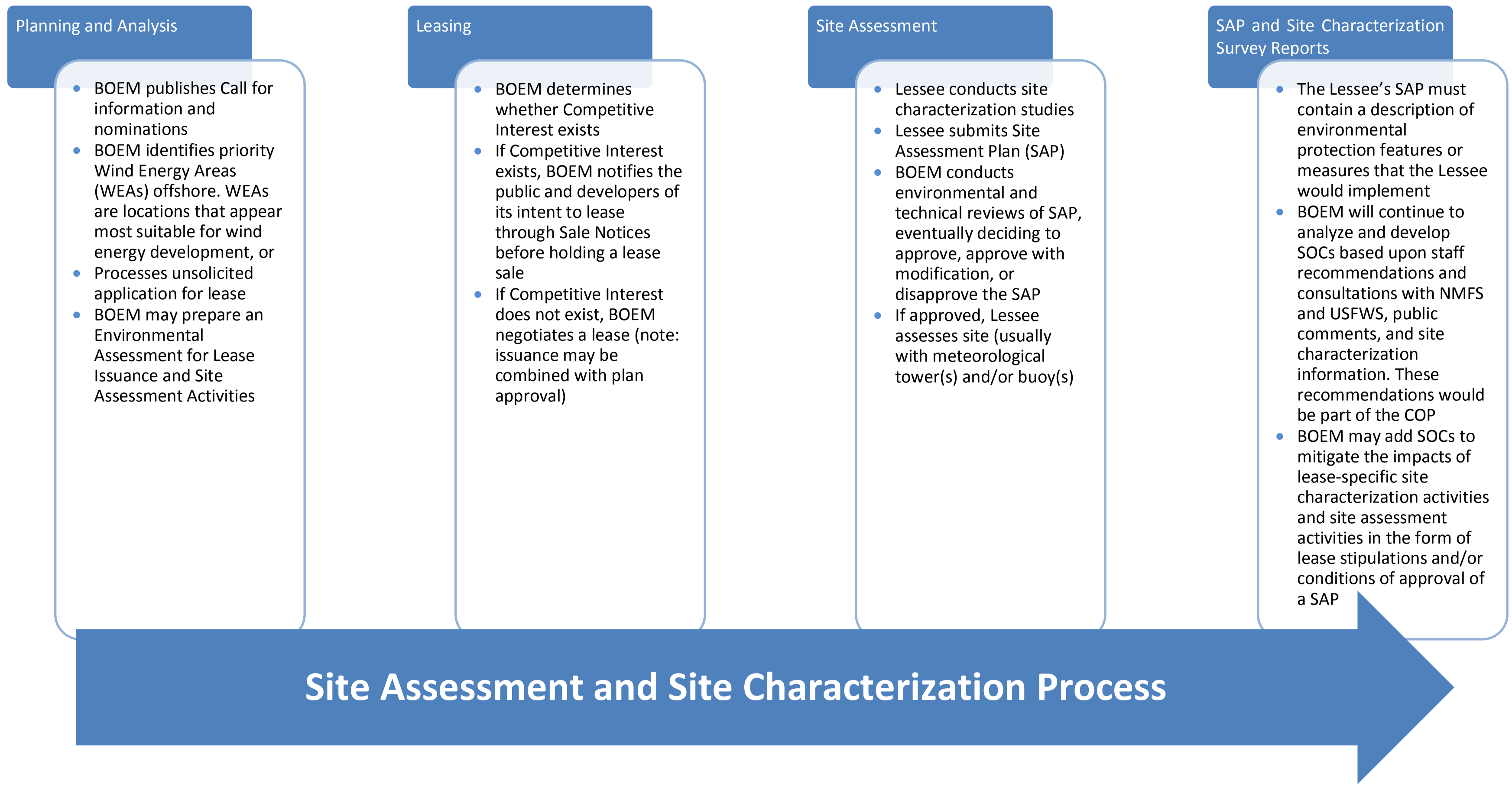

Figure 1-6 **Site Assessment and Site Characterization Process**

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2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes a number of geographic alternatives for lease issuance and the approval of site assessment activities within three WEAs offshore North Carolina. Alternatives are described in Table 2-1.

Table 2-1
Alternatives Considered

Alternative	Description
Alternative A (Preferred Alternative) – Full Leasing of WEAs	Under Alternative A, lease issuance and approval of site assessment activities could occur in all three WEAs offshore North Carolina (Figure 1-5).
Alternative B – Exclude Wilmington West WEA	Under Alternative B, lease issuance and approval of site assessment activities could occur in Kitty Hawk and Wilmington East WEAs. The Wilmington West WEA would not be leased due to potential impacts on North Atlantic right whales.
Alternative C – Site Characterization Seasonal Restrictions	Under Alternative C, lease issuance and approval of site assessment activities could occur in all three WEAs; however, high-resolution G&G surveys would be prohibited from November 1–April 30 because of migration patterns of North Atlantic right whales.
Alternative D – No Action Alternative	Under Alternative D, no leases would be issued offshore North Carolina and no site assessment or site characterization activities would occur in the WEAs.

These alternatives were identified as a result of extensive meetings with the NC Task Force; relevant consultations with federal, state, and local agencies; and extensive input from the public and potentially affected stakeholders. BOEM also received useful environmental, economic, use-conflict, and safety-related information in response to the Call and NOI. The alternatives were identified and defined by excluding certain areas of the WEAs because of the potential for affecting the following resources and uses:

- Visual/cultural resources
- Biological resources
- Navigation use conflicts/safety

2.1 Alternative A (Proposed Action) – Leasing of the Whole Wind Energy Areas

Alternative A (the preferred alternative) is the issuance of commercial and research wind energy leases within the entirety of the three WEAs offshore North Carolina and approval of site assessment activities on those leaseholds.

As a result of comments received on the Call and NOI, BOEM has identified three WEAs offshore North Carolina as the areas considered for wind energy development under the proposed action.

<u>Wilmington West</u> (Figure 2-1) consists of approximately nine OCS blocks. It begins 10 nm from the shore and extends roughly 12.3 nm in an east/west direction at its widest point. It includes approximately 51,595 acres.

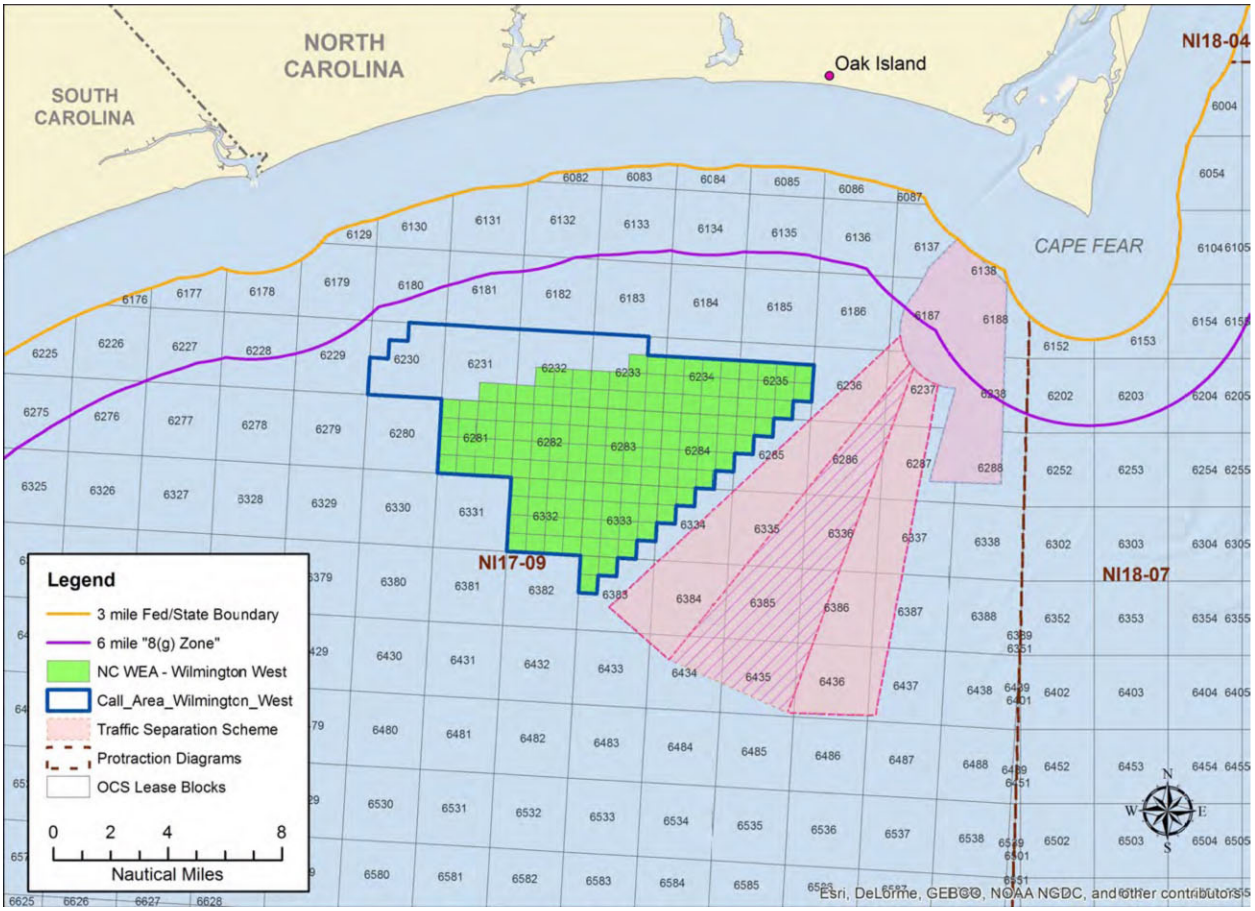

Figure 2-1 **Wilmington West WEA**

Wilmington East (Figure 2-2) consists of approximately 25 OCS blocks. Its boundary begins 15 nm from shore and extends 18 nm in a southeasterly direction at its widest point. It includes approximately 133,590 acres.

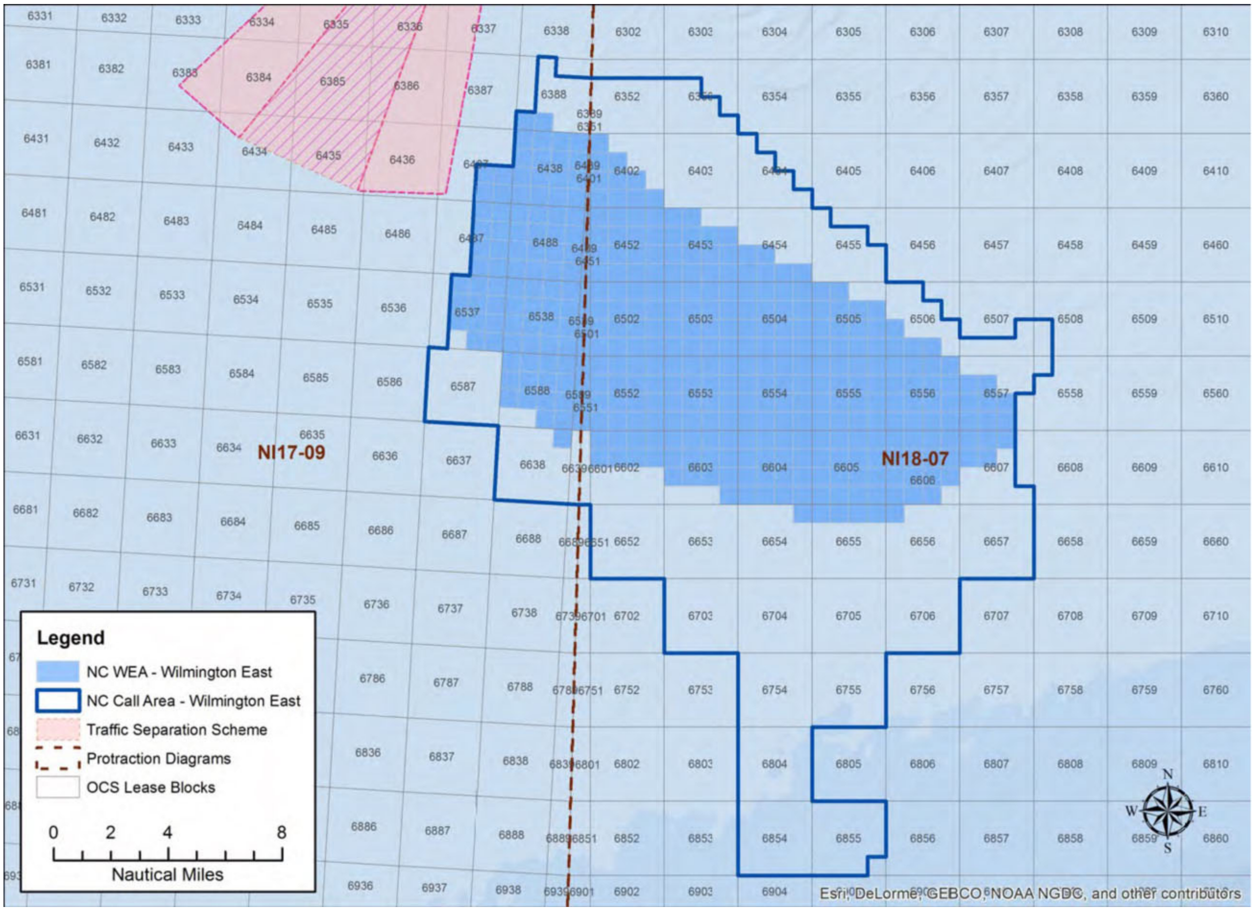

Figure 2-2 **Wilmington East WEA**

Kitty Hawk (Figure 2-3) consists of approximately 21.5 OCS blocks. Its boundary begins 24 nm from shore and extends seaward 13.5 nm in the north to 0.6 nm in the south. From north to south, it extends approximately 25.7 nm and includes approximately 122,405 acres.

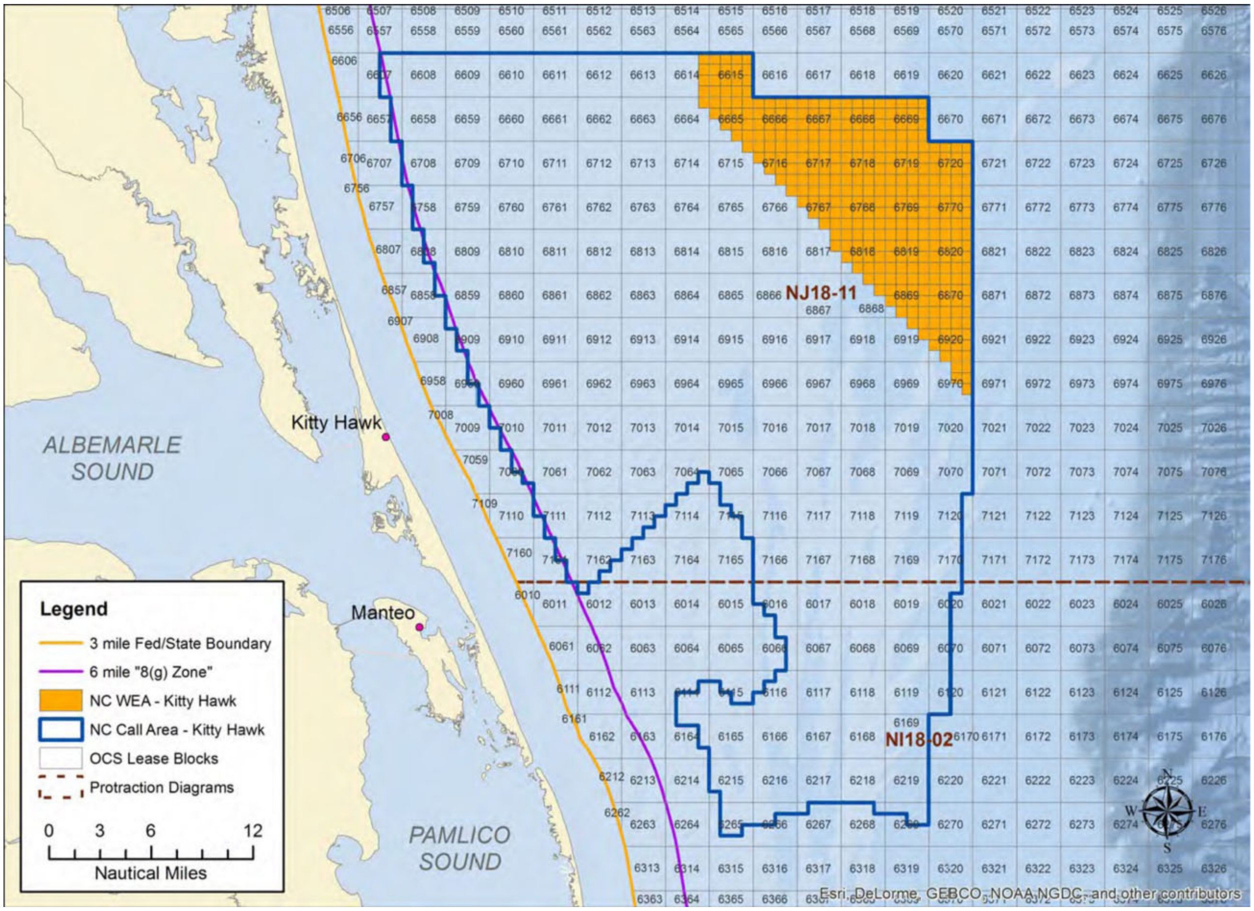

Figure 2-3 **Kitty Hawk WEA**

Alternative A contemplates leasing the maximum area of each WEA, resulting in up to three total leases. It should be noted that BOEM may not offer three leases. If BOEM elects to offer less than three leases, the impacts related to the installation of meteorological towers and meteorological buoys would be proportionally less based on the number of leases offered.

Like the other action alternatives, Alternative A assumes that lessees would undertake the maximum amount of site characterization surveys (i.e., shallow hazards, geological, geotechnical, archaeological, and biological surveys) in their leased areas, which, under Alternative A, would constitute the full area of each of the three WEAs. Under Alternative A, assuming that all lessees choose to install meteorological facilities, BOEM anticipates that up to three meteorological towers or six meteorological buoys, or some combination of meteorological towers and buoys, would be installed within the three WEAs. Site characterization, assessment, and biological survey activities are projected to result in a maximum of 1,927–1,999 round-trips by vessels over a 5-year period, which would be divided among major and smaller ports in Virginia, North Carolina, and South Carolina. Under Alternative A, as well as the other alternatives, BOEM would require lessees to comply with various requirements while conducting activities on their leases for the purpose of ensuring that potential impacts on the environment are avoided or minimized. These requirements are referred to as Standard Operating Conditions (SOC) and will be implemented through lease stipulations and/or as conditions of SAP approval.

2.2 Alternative B

To reduce the likelihood of impacts on North Atlantic right whales, Alternative B would exclude the entire Wilmington West WEA from leasing and site assessment activities. However, vessel traffic (particularly traffic associated with biological surveys) associated with the Wilmington East WEA would likely still traverse the excluded areas.

On January 17, 2013, NOAA submitted a letter in response to the NOI. The letter noted that North Atlantic right whale mother/calf pairs off Georgia and Florida are most often found in water temperatures ranging from 13 degrees Celsius (°C) to 15°C and most likely limited in their eastern distribution by the Gulf Stream. During the summer, North Atlantic right whales may be found in Cape Cod Bay and the Great South Channel where surface water temperatures rarely rise above 19°C and 17°C, respectively. Consequently, it is likely that North Atlantic right whales migrate along the mid-Atlantic in the cool water located west of the Gulf Stream. From Cape Hatteras southward, this band of cool water is found relatively close, within 30–40 nm, to shore, presumably including the proposed action area. This letter expressed concerns that development of both Call areas Wilmington West and Wilmington East would obstruct North Atlantic right whale migration and force North Atlantic right whales into the Cape Fear Traffic Separation Schemes (TSS), thereby increasing the risk of injury and mortality due to vessel collisions. NOAA requested that BOEM "demonstrate that wind farm planning, construction and operations with the Call Areas will not:

- Interfere with (obstruct) North Atlantic right whale migration along the mid-Atlantic.
- Cause serious injury or mortality to North Atlantic right whales.
- Cause migrating North Atlantic right whales to avoid the wind turbine fields and funnel into the Wilmington ship channel, resulting in an increased risk of vessel collisions to North Atlantic right whales. Simulating the acoustic properties of an operational wind turbine field prior to construction is advised. Leasing sites in the Wilmington West Call Area should be postponed until this issue can be resolved."

Although this EA analyzes only impacts of site characterization and site assessment activities, previous BOEM EAs, such as the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia Final EA*, have found that increased vessel traffic and construction of meteorological towers and/or buoys have the potential to result in temporary displacement of marine mammals, including North Atlantic right whales. Potential impacts on North Atlantic right whales that enter the Cape Fear TSS due to lease activities are analyzed in this EA, and the exclusion of the Wilmington West WEA is considered as an alternative to the proposed action.

The lease area under Alternative B is approximately 255,995 acres and contains 46.5 OCS blocks, consisting of the Kitty Hawk and Wilmington East WEAs, as described in Section 2.1.

Up to two meteorological towers and/or four meteorological buoys are assumed for the lease area under this alternative. Site characterization survey activity under Alternative B would be reduced by approximately 17%. The impacts of Alternative B on environmental and socioeconomic resources are described in detail in Section 4.5 of this EA.

2.3 Alternative C

Under Alternative C, lease issuance and subsequent site characterization and site assessment activities would occur in all three WEAs; however, certain site characterization activities would be restricted. The *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina, South Carolina, and Georgia Biological Assessment* (BA) (BOEM, 2014b) includes proposed mitigation measures, such as seasonal restrictions on pile driving, that apply to all alternatives. These restrictions would prohibit pile driving during the winter months when North Atlantic right whales migrate offshore North Carolina. Alternative C expands these restrictions to include site characterization activities (surveys). This alternative would limit vessel activity by excluding high-resolution G&G surveys from November 1 through April 30 to cover the North Atlantic right whale migratory period. Vessel traffic not associated with high-resolution G&G surveys (e.g., vessel-based and aerial avian, bat, marine mammal, sea turtle, and fish surveys) would not be restricted.

This alternative would be responsive to concerns from environmental groups about impacts on migrating North Atlantic right whales from noise generated by survey activities. Recently, environmental groups and wind developers have partnered to develop mitigation measures. Included in these measures are seasonal restrictions for site characterization activities. The impacts of Alternative C on environmental and socioeconomic resources are described in detail in Section 4.6 of this EA.

2.4 Alternative D – No Action

NEPA requires the analysis of a No-Action Alternative. Under the No-Action Alternative, no wind energy leases would be issued, and no site assessment activities would be approved within the WEA offshore North Carolina. Although site characterization surveys are not under BOEM's jurisdiction and could still be conducted, these activities would not be likely to occur without the possibility of a commercial energy lease.

2.5 Standard Operating Conditions

BOEM has developed several measures, called SOCs, that, as part of the proposed action, minimize or eliminate impacts on protected species, including species of marine mammals, sea turtles, fish, and birds that are listed under the Endangered Species Act (ESA). Conditions to minimize or eliminate impacts on marine mammals and sea turtles include vessel strike avoidance and marine debris awareness measures; protected species observers, exclusion and monitoring zones; sound source verification, ramp up, soft start and shutdown procedures; visibility, seasonal and frequency-dependent restrictions for various activities; as well as multiple reporting requirements. Conditions to minimize or eliminate impacts on avian species include the use of red-flashing aviation obstruction lights, requiring the use of navigation lights that meet USCG private aids to navigation requirements (PATON) for shipping vessels, requiring that additional lights on towers only be used when necessary and be hooded downward, and requiring that meteorological towers be designed to avoid using guy wires. Conditions to minimize or eliminate impacts on historic properties include identification and avoidance measures. Conditions to minimize or eliminate impacts on fish and essential fish habitat include soft start pile driving measures. The SOCs are detailed in Section 4.4.2.1, Section 4.4.4.1, Section 4.4.2.5, Section 4.4.2.8, and Appendix B. These SOCs were developed through the analyses presented in Section 4.4 and through consultation with other federal and state agencies (see Figure 1-6).

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3. SCENARIO OF REASONABLY FORESEEABLE ACTIVITY AND IMPACT-PRODUCING FACTORS

The purpose of this section is to provide a description of the impact-producing activities under the proposed action and alternatives. The G&G Final PEIS (BOEM, 2014a), which is incorporated here by reference, fully describes the activities that would be conducted during site characterization and buoy installation as a result of issuing leases in the three WEAs offshore North Carolina. The EA that was available for public comment from January 23, 2015 to February 23, 2015 relied on BOEM's *Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 585* (BOEM, 2012a) to describe the geophysical survey methods for site characterization activities considered in this EA. In July 2015, BOEM issued updated guidance for geophysical surveys (see Section 3.2.1 below), and the EA has been revised to reflect the changes in those guidelines. Brief descriptions of the G&G activities specific to the North Carolina WEAs are also provided below.

Installation, operation, and decommissioning of meteorological towers are not described in the G&G Final PEIS (BOEM, 2014a); a full description is provided in this EA below.

3.1 Assumptions for Reasonably Foreseeable Scenario

This EA uses a "reasonably foreseeable scenario," evaluating the maximum amount of site characterization surveys (i.e., shallow hazards, geological, geotechnical, archaeological, and biological surveys) and site assessment activities (i.e., installation of data collection devices under approved SAPs) that could be conducted as a result of the proposed action. BOEM assumes the following:

- BOEM would issue one lease per WEA, resulting in up to three total leases.
- For each WEA, zero to one meteorological tower, one to two buoys, or a combination would be constructed or deployed, for a total of up to 3 meteorological towers and 6 meteorological buoys.
- Site characterization would take place: years 1 through 3 following execution of the lease.
- Meteorological tower installation and decommissioning, and site assessment activities would likely occur April to August.
- The entire WEAs would be surveyed once to collect required information for siting site assessment and commercial facilities. The surveys may be completed in phases, with the meteorological tower and buoy areas performed first.

The following sections outline the proposed action scenario (Alternative A) based on previous lease applications submitted to BOEM and public comments and expressions of interest received in response to the Call and NOI associated with the WEAs offshore North Carolina.

3.2 Routine Activities

3.2.1 Site Characterization Surveys

BOEM regulations require that the lessee provide the results of a number of surveys with its SAP (30 CFR 585.610–585.611) and COP (30 CFR 585.626(a)(1)). BOEM refers to these surveys as "site characterization" activities. It is assumed that the site of a meteorological tower or buoy would be surveyed first to meet the information requirements for a lessee's SAP (30 CFR 585.610–585.611), and the site would not be resurveyed when the remainder of the leasehold is surveyed to meet the data requirements for a lessee's COP (30 CFR 585.626(a)). Site characterization survey types include:

- Shallow hazards (30 CFR 585.610(b)(2) and 30 CFR 585.626(a)(1)),
- Geological (30 CFR 585.610(b)(4) and 30 CFR 585.616(a)(2)),
- Geotechnical (30 CFR 585.610(b)(1) and 30 CFR 585.626(a)(4)),
- Biological surveys (30 CFR 585.610(b)(5) and 30 CFR 585.626(a)(3)), and
- Archaeological (30 CFR 585.626(a) and (30 CFR 585.610–585.611).

BOEM publishes guidelines that provide recommendations for acquiring the site characterization data required under 30 CFR 585.610–585.611 and 30 CFR 585.626(a). These guidelines were revised in July 2015 and published as two documents: *Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585* (BOEM, 2015a) and *Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585* (BOEM, 2015b) (see http://www.boem.gov/Survey-Guidelines/). In these guidelines, BOEM provides recommendations of survey methods that BOEM expects will yield site characterization information sufficient to allow the agency to consider approving a SAP or COP. For the purposes of this scenario, BOEM assumes that all lessees would employ these methods or methods in similar manners to acquire the information required under 30 CFR 585.610–585.611 and 30 CFR 585.626(a).

The different types of surveys require data to be collected at varying line spacings. However, because the same vessel (or group of vessels) following the smallest line spacing could conduct all of the surveys necessary to acquire all of the relevant data in a single trip, the smallest line spacing, which is 98 feet (30 meters) for the archaeological resource survey, is assumed for considering the impacts of site characterization activities.

3.2.1.1 High-Resolution Geophysical Surveys

The purpose of the high-resolution geophysical (HRG) survey would be to acquire geophysical shallow hazards data and information pertaining to the presence or absence of archaeological resources, and to conduct bathymetric charting. Assuming lessees would follow BOEM's guidelines to meet the geophysical data requirements at 30 CFR 585.610–585.611 and 30 CFR 585.626(a), BOEM anticipates that the surveys would entail the following:

- For the collection of geophysical data for shallow hazards assessments, side-scan sonar/ sub-bottom profilers would be flown at 150-meter line spacing over the lease area;

- For collecting geophysical data for archaeological resources assessments, magnetometers, side-scan sonar, and all sub-bottom profilers would be flown at 30-meter line spacing; and
- For bathymetric charting, lessees would likely use a multi-beam echosounder at a line spacing appropriate to the range of depths expected in the survey area.

The HRG survey grids for proposed transmission cable routes to shore would most likely include a minimum 984-foot-wide (300-meter-wide) corridor centered on the transmission cable locations to allow for all anticipated physical disturbances and movement of the proposed location, if necessary. Because it is not yet possible to predict precisely where a power substation may ultimately be installed on any given lease or the route that any potential future transmission line would take across the seafloor to shore, this EA uses direct lines between the middle of the potential lease areas and potential interconnection points onshore to approximate the reasonably foreseeable level of surveys that may be conducted to characterize undersea transmission cable routes (Figures 3-1 through 3-3 and Tables 3-1 and 3-2). Figures 3-1 through 3-3 show only the line used to approximate the level of surveys and in no way represent a proposed cable route. A lessee would be required to submit detailed information on proposed cable route(s) within their COP. BOEM would then analyze the proposed route(s) in a project-/site-specific environmental document.

Assumptions for the cable routes:

- One cable route for each individual lease,
- 984-foot-wide (300-meter-wide) survey corridor to shore, and
- 5 nm of survey line per mile of cable corridor equals 1 hour of survey per mile of cable.

Possible types of equipment to be used to perform surveys are summarized below. Equivalent technologies may be used as long as their impacts are similar to the equipment described in this EA.

Bathymetry/Depth Sounder: A depth sounder is a microprocessor-controlled, high-resolution survey-grade system that measures precise water depths in both digital and graphic formats. The system would be used in such a manner as to record with a sweep appropriate to the range of depths expected in the survey area. This EA assumes the use of multi-beam bathymetry systems, which may be more appropriate than other tools for characterizing those lease areas containing complex bathymetric features or sensitive benthic habitats such as hard-bottom areas.

Magnetometer: Magnetometer surveys would be used to detect and aid in the identification of ferrous or other objects having a distinct magnetic signature. The magnetometer sensor is typically towed as near as possible to the seafloor, which is anticipated to be no more than approximately 20 feet (6 meters) above the seafloor.

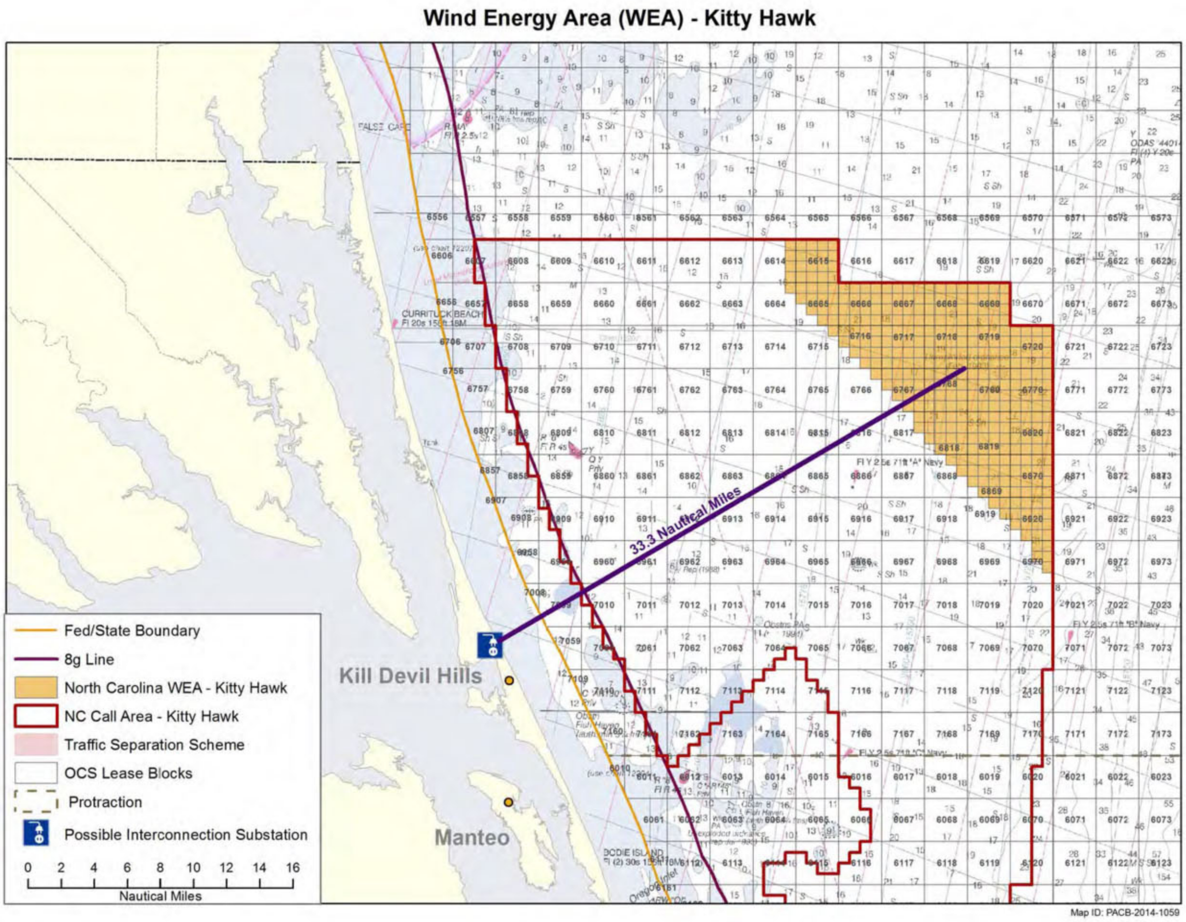

Figure 3-1 Cable Route Used to Approximate Level of Surveys (Kitty Hawk WEA)

Wind Energy Area (WEA) - Wilmington East

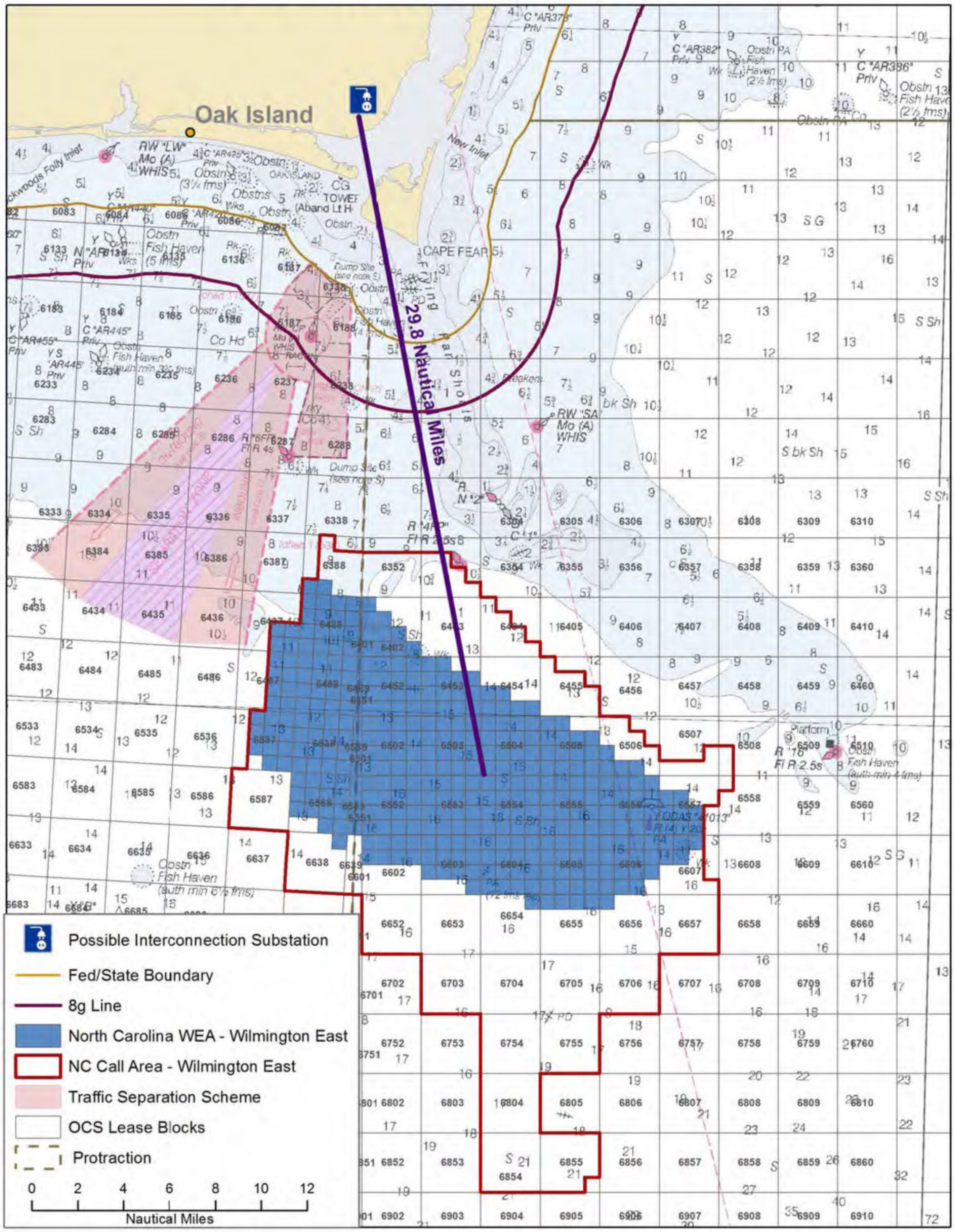

Figure 3-2 Cable Route Used to Approximate Level of Surveys (Wilmington East WEA)

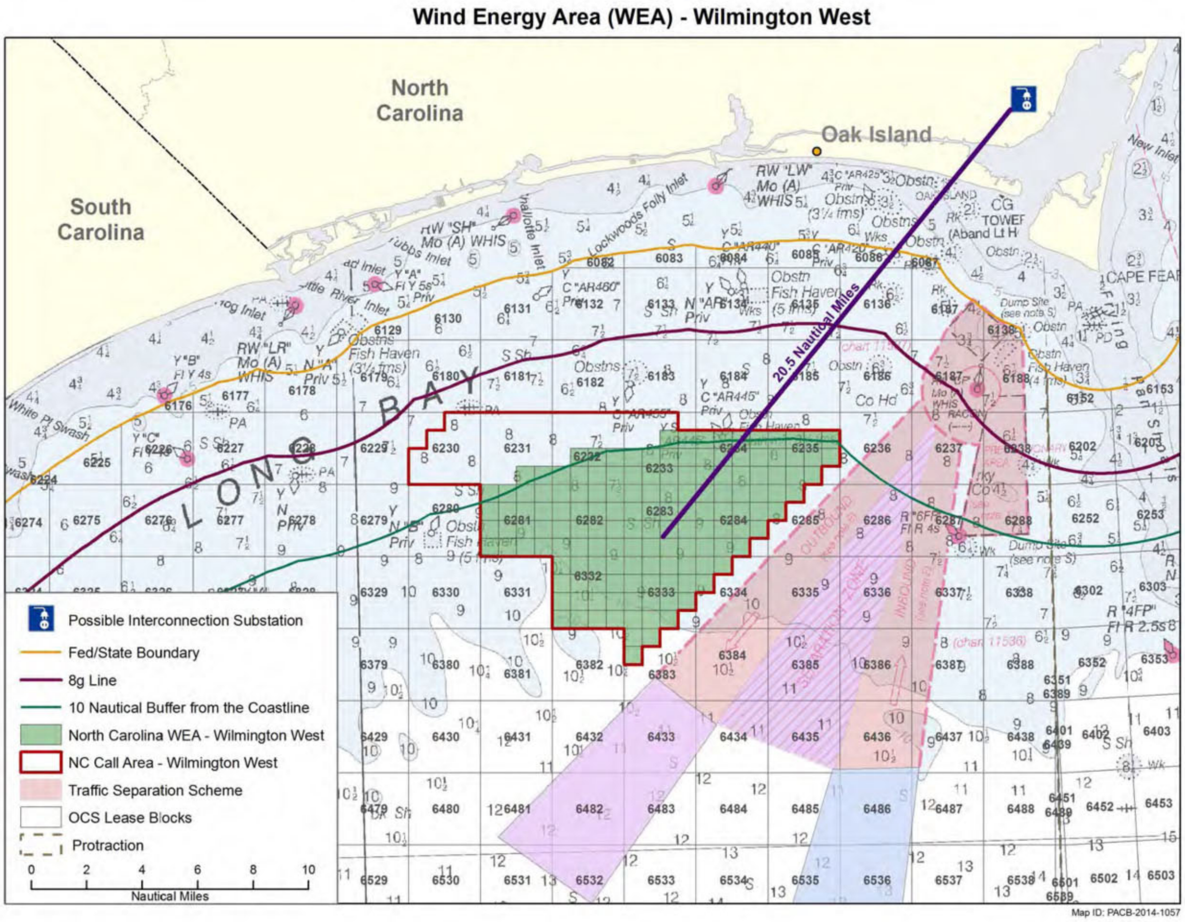

Figure 3-3 **Cable Route Used to Approximate Level of Surveys (Wilmington West WEA)**

Table 3-1
HRG Cable Route Surveys and Vessel Trips

WEA	OCS Blocks	Total Nautical Miles of Cable Route	Number of Days and Round Trips[1]
Kitty Hawk	21.5	33.3	1
Wilmington East	25	29.8	1
Wilmington West	9	20.5	1
Total	**55.5**	**83.6**	**3**

[1] One round-trip vessel trip per OCS block.

Table 3-2
HRG Surveys and Vessel Trips for the Proposed Action (Alternative A)

WEA	OCS Blocks	Number of Days and Round Trips
Kitty Hawk	21.5	236
Wilmington-East	25	275
Wilmington-West	9	99
Total	**55.5**	**610**

Side-Scan Sonar: This survey technique is used to evaluate surface sediments, seafloor morphology, and potential surface obstructions (MMS, 2007a). A typical side-scan sonar system consists of a top-side processor, tow cable, and towfish with transducers (or "pingers") located on the sides, which generate and record the returning sound that travels through the water column at a known speed. BOEM assumes that lessees would use a digital dual-frequency side-scan sonar system with 300 to 500 kilohertz (kHz) frequency ranges or greater to record continuous planimetric images of the seafloor.

Shallow and Medium (Seismic) Penetration Sub-bottom Profilers: Typically, a high-resolution Compressed High Intensity Radar Pulse (CHIRP) System sub-bottom profiler is used to generate a profile view below the bottom of the seabed, which is interpreted to develop a geologic cross-section of subsurface sediment conditions under the track line surveyed. Another type of sub-bottom profiler is a boomer or impulse-type system. Sub-bottom profilers are capable of penetrating sediment depth ranges of 10 feet (3 meters) to greater than 328 feet (100 meters), depending on frequency and bottom composition.

Assumptions for HRG Surveys include:

- Survey line spacing: 98 feet (30 meters),
- Length of surveys per OCS block: 500 nm,
- Length of survey per partial OCS block: 250 nm,
- Approximate vessel speed: 4.5 knots,
- Work day: 10 hours,
- Survey time for one OCS block: 11 days, and
- Round trips per day from port to survey area: 1/day.

3.2.1.2 Geotechnical/Sub-bottom Sampling

The geotechnical sampling techniques that could be used for the geophysical and geotechnical survey activities associated with the proposed action and used to characterize the sub-bottom environment of the WEAs were previously analyzed in the G&G Final PEIS (BOEM, 2014a) and are hereby incorporated by reference. In summary, the G&G Final PEIS

(BOEM, 2014a) provides an overview of the geotechnical sampling techniques and devices (such as bottom-sampling devices, vibracores, deep borings, and cone penetration tests [CPTs]) that would be used to assess the suitability of shallow sediments to support a structure foundation or transmission cable under any operational and environmental conditions that could potentially be encountered (including extreme events), as well as to document the sediment characteristics necessary for design and installation of all structures and cables.

The USACE Nationwide Permit (NWP) Program (USACE, 2012) was developed to streamline the evaluation and approval process for certain types of activities that have only minimal impacts on the aquatic environment. NWP 6 addresses survey activities such as core sampling, seismic exploratory operations, plugging of seismic shot holes and other exploratory-type bore holes, exploratory trenching, soil surveys, sampling, and historic resources surveys. Most site characterization surveys that require seafloor disturbance would require an NWP 6. A standard permit may be required from USACE if the proposed survey activities do not meet the terms and conditions of the NWP or if USACE determines that the survey activities will result in more than minimal adverse effects on the aquatic environment.

Samples for geotechnical evaluation are typically collected using shallow-bottom coring and surface sediment sampling devices from a small marine drilling vessel. Methods to obtain samples to analyze physical and chemical properties of surface sediments are described below.

Bottom-sampling devices: Bottom-sampling devices have the ability to penetrate depths ranging from a few centimeters to several meters below the seafloor. A piston core or gravity core is often used to obtain samples of soft surficial sediments. Unlike a gravity core, which is essentially a weighted core barrel that is allowed to free-fall into the water, piston cores have a "piston" mechanism that triggers when the corer hits the seafloor. The main advantage of a piston core over a gravity core is that the piston helps to avoid disturbance of the sediment sample and allows for the best possible sediment sample (MMS, 2007a). Shallow-bottom coring is a method that employs a rotary drill that penetrates through several feet of consolidated rock. None of the above sampling methods uses high-energy sound sources (Continental Shelf Associates, Inc., 2004; MMS, 2007a).

Vibracores: Vibracores are often used for obtaining samples of unconsolidated sediment or when there are known or suspected archaeological and/or cultural resources present that may have been identified through the HRG survey (BOEM, 2015b). Vibracore samplers typically consist of a core barrel and an oscillating driving mechanism that propels the core barrel into the sub-bottom. Once the core barrel is driven to its full length, the core barrel is retracted from the sediment and returned to the deck of the vessel. Typically, cores up to 20 feet (6 meters) with 3-inch (8-centimeter) diameters are obtained, although some devices have been modified to allow for samples up to 40 feet (12 meters) long (MMS, 2007a; USACE, 1987).

Deep borings: Deep borings may be used to sample and characterize the geological properties of the sediments at the maximum expected depths of the structure foundations (MMS, 2007a). Deep borings take place on a drill rig on a jack-up barge that is supported by four "spuds" that are lowered to the seafloor. Geologic borings can generally reach depths of 100 to 200 feet (30 to 61 meters) within a few days (based on weather conditions). The acoustic levels from deep borings can be expected to be in the range of 118 to 145 decibels (dB) at a frequency of 120 hertz (Hz), which would be below the 160 dB threshold established by NMFS for marine mammals.

Cone Penetration Test (CPT): CPTs could supplement or be used in place of deep borings (BOEM, 2015a). A CPT rig would be mounted on a jack-up barge similar to that used for the deep borings. The top of a CPT drill probe is typically up to 3 inches (8 centimeters) in diameter, with connecting rods less than 6 inches (15 centimeters) in diameter.

CPTs and bore holes are often used together because they provide different data on sediment characteristics. A CPT provides a fairly precise stratigraphy of the sampled interval, plus other geotechnical data, but does not allow for capture of an undisturbed soil sample. Bore holes can provide undisturbed samples, but are most effectively used in conjunction with CPT-based stratigraphy so that sample depths can be pre-determined. A CPT is suitable for use in clay, silt, sand, and granule-sized sediments as well as some consolidated sediment and colluvium. Bore hole methods can be used in any sediment type and in bedrock. Vibracores are suitable for extracting continuous sediment samples from unconsolidated sand, silt, and clay-sized sediment up to 33 feet (10 meters) below the surface. Bottom conditions offshore North Carolina are characterized by sections of sedimentary, firm, and hard bottoms. Hard-bottom conditions are rare in the Pamlico and Albemarle Sounds, but abundant 50 to 100 feet off the Bogue Inlet (UNC, 2009). In Onslow and Long Bay, the shelves are dominated by hard bottoms due to the rock-floored character surrounding the mid-Carolina Platform High, with firm bottoms located in the western portion of Onslow Bay. In the Northern Province, which is slightly steeper, the bottom conditions are primarily composed of soft sediment units along with substantial amounts of unconsolidated sediment (UNC, 2009).

Sub-bottom sampling would be conducted for each WEA and would require a sub-bottom sample at every potential wind turbine location and one sample per each nautical mile of transmission cable corridor. Below is the list of assumptions used to calculate the total number of surveys and vessel trips per WEA:

- Maximum of 20 wind turbines per OCS block,
- Maximum of 10 wind turbines per partial OCS block,
- One sub-bottom sample (vibracore, CPT, and/or deep boring) at every potential wind turbine location,
- One sub-bottom sample every nautical mile of transmission cable corridor,
- One sub-bottom sample at each meteorological tower and/or buoy, and
- One sample (vibracore, CPT, and/or deep boring) conducted per workday. Each workday would be associated with one round trip.

The amount of effort and vessel trips required to collect the geotechnical samples vary greatly by the type of technology used to retrieve the sample.

- Vibracore samples would most likely be advanced from a single small vessel (approximately 45 feet [14 meters]).
- CPT sampling would depend on the size of the CPT; it could be advanced from medium vessel (approximately 65 feet [20 meters]), a jack-up barge, a barge with a four-point

anchoring system, or a vessel with a dynamic positioning system. Each barge scenario would include a support vessel.

- Geologic borings would be advanced from a jack-up barge, a barge with a four-point anchoring system, or a vessel with a dynamic positioning system. Each barge scenario would include a support vessel.

Based on these assumptions and survey techniques, a total of 1,204 sub-bottom samples would be required to cover the three WEAs, for a total of 1,204 vessel round trips (Table 3-3).

Table 3-3
Sub-bottom Sampling Surveys and Vessel Trips for the Proposed Action (Alternative A)

WEA	OCS Blocks	Approximate Number of Sub-bottom Samples by OCS Block	Approximate Number of Sub-bottom Samples per nm of cable	Approximate Number of Sub-bottom Samples for Meteorological Tower and/or Buoy	Total Number of Sub-bottom Sampling	Total Number of Vessel Round Trips
Kitty Hawk	21.5	430	34	3	467	467
Wilmington East	9	180	30	3	213	213
Wilmington West	25	500	21	3	524	524
Total	**55.5**	**1,110**	**85**	**9**	**1,204**	**1,204**

3.2.1.3 Biological Surveys

Under BOEM's regulations, the SAP, COP, and General Activities Plans must describe biological resources that could be affected by the activities proposed in the plan, or that could affect the activities proposed in the plan (see 30 CFR 585.611(a)(3); 30 CFR 585.626(a)(3); and 30 CFR 585.645(a)(5)). To support development of these plans, three primary categories of biological resources would need to be characterized using vessel and/or aerial surveys of the lease area: (1) benthic habitats; (2) avian resources; and (3) marine fauna. Survey methods and timing are listed in Table 3-4 and further described below.

Table 3-4
Biological Survey Types and Methods

Biological Survey Type	Survey Method	Timing
Benthic Habitat	Bottom sediment/fauna sampling (sampling methods described above under geotechnical surveys)	See Section 3.2.1.2, *Geotechnical/Sub-bottom Sampling*
Avian	Visual surveys from a boat	10 OCS blocks per day; monthly for 2 to 3 years
	Plane-based aerial surveys	Two days per WEA or monthly for 2 to 3 years
Bats	Ultrasonic detectors installed on survey vessels being used for other biological surveys	Monthly for 3 months per year (March through November)
Marine Fauna (marine mammal, fish, and sea turtle)	Plane-based and vessel surveys – may be concurrent with other biological surveys	Two annual cycles in area of potential effect

Assumptions:

- All vessels and aircraft associated with the proposed action would be required to abide by the SOCs detailed in Appendix B, and
- NMFS may require additional measures from the lessee to comply with the Marine Mammal Protection Act (MMPA).

3.2.1.4 Benthic Habitat Surveys

Samples collected from the geotechnical sampling of shallow sediments and information from geophysical surveys would help identify sensitive benthic habitats. These surveys would acquire information suggesting the presence or absence of exposed hard bottoms of high, moderate, or low relief; hard bottoms covered by thin, ephemeral sand layers; and algal beds, all of which are key characteristics of sensitive benthic habitat. There are two protocol surveys emphasized within the BOEM Benthic Habitat Survey Guidelines (BOEM, 2013c): a Sediment Scour and/or Deposition Survey and a Benthic Community Composition Survey. The first involves particle size analysis or sediment-profile imaging (SPI) and multibeam/interferometric bathymetry (with the collection of backscatter data). The second requires benthic imagery (i.e., underwater video or still imagery of sediment bottom type) as well as physical sampling using one of the following methods:

- Hamon grab (hard bottom),
- Van Veen grab (soft sediment), and/or
- Benthic sled.

BOEM believes that these surveys can be conducted concurrently with other geophysical sampling and that lessees would not need to conduct separate biological surveys to delineate benthic habitats. However, if the benthic surveys, G&G surveys, or other information identify the presence of sensitive benthic habitats on the leasehold, then further investigations would likely be necessary.

3.2.1.5 Avian Resource Surveys

If avian surveys are required, BOEM anticipates that 1 to 3 years of surveys would be necessary to document the distribution and abundance of bird species within the area. This survey timeframe is based on the guidelines for providing avian information (BOEM, 2013b), which indicate that lessees must document the spatial distribution of avian resources in the areas proposed for development, incorporating both seasonal and inter-annual variation. Historically, avian data have been collected using a combination of boat and aerial surveys. Boat surveys could be completed in a single day for approximately 10 OCS blocks when subsampling 10% of the area, which is standard practice (Thaxter and Burton, 2009). A monthly sampling interval for boat-based surveys represents an upper limit of survey frequency; therefore, 2 to 3 years of surveying at monthly intervals would be anticipated.

Although both boat-based and aerial surveys using visual observers have been used in the past, including for offshore wind baseline studies in the United States (NJDEP, 2010a; Paton et al., 2010), these methodologies have been largely replaced by aerial digital imaging surveys in Europe because of reduced observer effects, higher statistical and scientific validity of the data, and the ability to conduct surveys at altitudes above the rotor swept zone of commercial marine wind turbine rotors (Rexstad and Buckland, 2009; Thaxter and Burton, 2009).

3.2.1.6 Bat Resource Surveys

Bats use echolocation when orienting through space, and ultrasonic detectors are a cost-effective method for monitoring multiple bat species on a large spatial scale because bat species emit echolocation calls with species-specific characteristics. Ultrasonic detectors are portable and can be easily installed on survey vessels being used for other biological surveys. BOEM assumes that bat acoustic surveys would be conducted during the fall migration period and, if necessary, during the spring migration.

3.2.1.7 Marine Fauna Surveys

Lessees are required to characterize the marine fauna (i.e., marine mammals, sea turtles, and fish species) occurring within their lease areas and include this information in their plan submissions (30 CFR 585.610(a)(8)). Lessees may use existing information, if the information meets plan requirements. If biological information is not available or does not meet plan requirements for specific lease areas, data gaps or special circumstances may need to be addressed and filled by survey work (BOEM, 2013d). BOEM, the U.S. Department of Energy, and state governments are in the process of collecting biological information in several of the Atlantic WEAs. Regional-scale efforts, including the NOAA/BOEM Atlantic Marine Assessment Program for Protected Species, will also aid in site characterization. The results of these studies could be used to determine whether additional surveys would be necessary to document marine mammal or sea turtle resources in the WEAs prior to submitting a plan. BOEM anticipates that any vessel or aerial traffic associated with marine fauna surveys would not markedly add to current levels of traffic within the WEAs.

3.2.1.8 Port Facilities

Specific ports that would be used by lessees would be determined in the future and primarily by proximity to the lease blocks, capacity to handle the proposed activities, and/or established business relationships between port facilities and lessees.

3.2.1.9 Major Ports

Installation of meteorological towers and buoys would require "major ports" with deep-water access greater than 15 feet (4.6 meters) to accommodate vessels, and fabrication yards for staging and assembly. Other site characterization activities could be supported by smaller ports because they can utilize smaller vessels.

The following major ports have been identified:

- Port of Virginia, Norfolk, VA
- Wilmington, NC,
- Charleston, SC,
- Port of Georgetown, SC – approximately 60 miles north of Charleston, it is a dedicated breakbulk and bulk cargo port, and
- Port of Morehead City, NC – large, deep-water port located about midway between the Kitty Hawk WEA and the Wilmington WEAs.

3.2.1.10 Minor Ports

"Minor" ports are characterized as those that would serve as staging areas and crew/cargo launch sites for the survey vessels, which are anticipated to be approximately 65 to 100 feet (20 to 30 meters) in length. In addition to the major ports listed in Section 3.2.1.9, the following Minor Ports could support other site characterization activities:

- Wanchese, NC – primarily a small fishing port,
- Southport Marina, NC – primarily a small fishing and recreational marina, and
- Hatteras Harbor Marina, NC – primarily a recreational fishing marina.

3.2.1.11 Vessel Traffic Associated with Site Characterization

This EA assumes that vessels associated with site assessment would strongly trend to larger ports, while vessels associated with site characterization activities would use whatever port is convenient. As a result, this EA assumes that the total vessel traffic associated with the proposed action would be more or less evenly distributed among several major and minor ports in North Carolina, South Carolina, and Virginia.

Based on the assumptions for all site characterization surveying under the proposed action, BOEM anticipates the total number of vessel round trips in Table 3-5, below. Vessel trips would primarily occur between the months of April and August, over a 5-year period. Appendix C contains vessel trip assumptions and calculations associated with site characterization. HRG surveys assume a vessel speed of 4.5 knots (Continental Shelf Associates, Inc., 2004) and 10-hour days (daylight hours minus transit time to and from the site). For geotechnical sampling, this scenario assumes one sample (vibracore, CPT, and/or deep boring) conducted per workday. Each workday would be associated with one round trip. This EA assumes that vessels associated with site assessment would most likely be launched from larger ports, while vessels associated with site characterization activities would use the port that is most convenient (major or minor).

Table 3-5
Total Number of Maximum Vessel Trips for Site Characterization Activities

Survey Task	Total Round Trips[1]
HRG Surveys of OCS Blocks within WEAs under Alternative A	610
HRG Surveys of Cable Routes	3
Geotechnical Sampling	1,110
Avian Surveys	144–216
Fish Surveys	60
Total	1,927–1,999

[1] Ranges are provided when data or information was available to determine an upper and lower number of round trips. Otherwise, only a maximum value was determined.

3.2.1.12 Operational Waste Associated with Covered Activities

Operational wastes would be generated from all vessels associated with the proposed action. Requirements for management and disposal of bilge and ballast waters; solid waste (trash and debris); and sanitary/domestic wastes are described in the 2012 *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia Final Environmental Assessment* (BOEM, 2012b). BOEM assumes that these requirements would be followed and hereby incorporates them by reference.

The U.S. Environmental Protection Agency (EPA) regulates discharges incidental to the normal operation of all non-recreational, non-military vessels greater than 79 feet (24 meters) in length into U.S. waters under Section 402 of the Clean Water Act. EPA requires that eligible vessels obtain coverage under the National Pollutant Discharge Elimination System Vessel General Permit. Non-recreational vessels less than 79 feet (24 meters) in length and military vessels are not subject to this permit (see Figure 3-4). A separate, streamlined permit is available for vessels less than 79 feet (Small Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels Less than 79 Feet). Typical discharges eligible for coverage under the Vessel General Permit include deck runoff, graywater (from showers, sinks, laundry facilities, etc.), bilgewater, and ballast water. The discharge of any oil or oily mixtures within bilgewater is prohibited under 33 CFR 151.10; however, discharges may occur in waters greater than 12 nm from shore if the oil concentration is less than 100 parts per million. Ballast water is less likely to contain oil but is subject to the same limits. Ballast water is used to maintain stability of the vessel and may be pumped from coastal or marine waters. Generally, the ballast water is pumped into and out of separate compartments and is not usually contaminated with oil; however, the same discharge criteria apply as for bilgewater (33 CFR 151.10). Ballast water is subject to the USCG Ballast Water Management Program to prevent the spread of aquatic nuisance species. The discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by BOEM (30 CFR 250.300) and USCG (International Convention for the Prevention of Pollution from Ships [MARPOL], Annex V, Public Law 100–220 [101 Stat. 1458]). The Act to Prevent Pollution from Ships (APPS) is a U.S. federal law that was enacted to implement the provisions of MARPOL. The APPS applies to all U.S. flagged ships all across the globe and to all foreign flagged vessels operating in navigable waters of the United States or while at port under U.S. jurisdiction. The provisions of the APPS are found under 33 U.S.C. § 1901 through 1915 and are regulated and enforced by USCG.

3.2.2 Site Assessment Activities and Data Collection Structures

No site assessment activities could take place on a lease until BOEM has approved a lessee’s SAP, which would most likely include installation of meteorological towers and/or buoys (see 30 CFR 585.600(a)). Once approved, site assessment activities could occur over a 5-year period from the date of the lease. This EA assumes that each lessee would install some type of data collection device (i.e., meteorological tower, buoy, or both) on its lease area to assess the wind resources and ocean conditions of the lease area.

The following scenario is broad enough to address the range of data collection devices that may be installed under approved SAPs. The actual tower and foundation type and/or buoy type and anchoring system would be included in a detailed SAP submitted to BOEM, along with the results of site characterization surveys, prior to installation of any device(s).

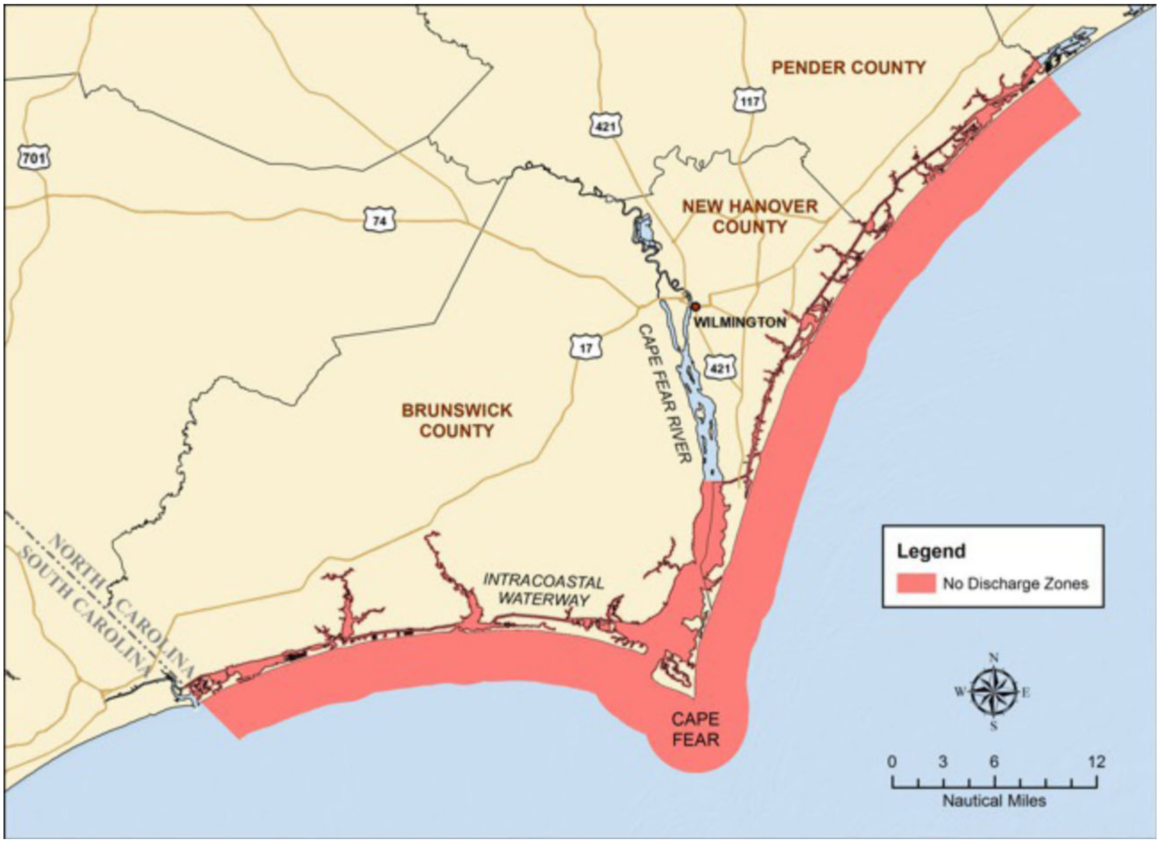

Figure 3-4 North Carolina No Discharge Areas

3.2.2.1 Meteorological Towers and Foundations

One of the traditional instruments used for characterizing wind conditions is the meteorological tower. A typical meteorological tower consists of a mast mounted on a foundation anchored to the seafloor. The mast may be either a monopole or a lattice type (similar to a radio tower) (see Figures 3-5 and 3-6, respectively). Mast and data collection devices can be mounted on a fixed or pile-supported platform (monopile, jackets, or gravity bases) or on a floating platform (spar, semi-submersible, or tension-leg). Different types of foundations include tripod, monopile, or steel jacket. The mast, platform, and foundation types are described in further detail (including images and measurement specifications) in the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Revised Final Environmental Assessment* (BOEM, 2014c) and hereby incorporated by reference.

Figure 3-5 Example of Monopole-mast Meteorological Tower

Source: BOEM, 2011d

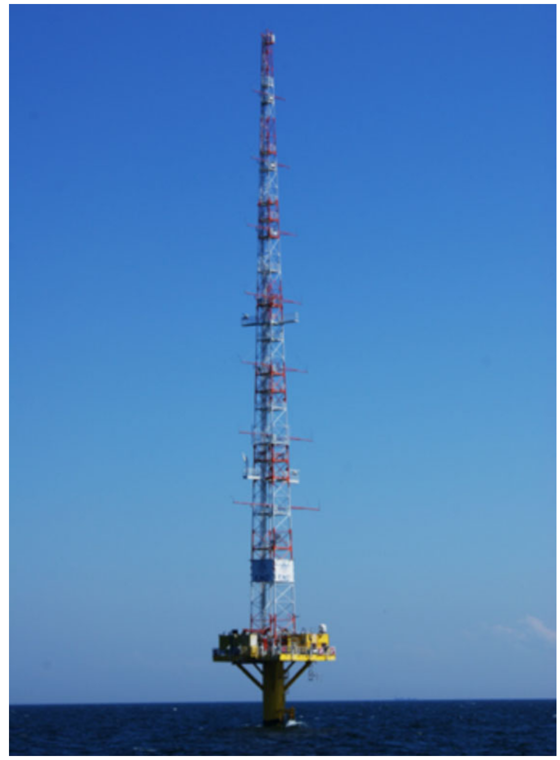

Figure 3-6 Example of Lattice-mast Meteorological Tower with a Monopile Foundation

Source: GL Garrad Hassan, 2012 as cited in BOEM, 2014c

To date, no proposals have been submitted for data collection devices or meteorological towers mounted on a floating platform (spar, semisubmersible, or tension-leg). These types of structures will not be evaluated in this EA, but, should BOEM receive an application for a floating platform meteorological tower structure, the agency would consider whether such a platform would lead to environmental consequences not considered in this EA. This is also the case with respect to meteorological foundations. If foundation selection by the lease holder is different from the meteorological tower specifications presented in this EA, BOEM would make the same consideration regarding adequacy of the analysis of environmental consequences provided in this EA. If so, the specifications for the selected tower will be included in a detailed Project Plan submitted to BOEM after site characterization surveys are conducted and prior to construction.

Different types of foundations include tripod (see Figure 3-5), monopile (see Figure 3-6a), or steel jacket (see Figure 3-6b). Characteristics of these foundation types are summarized in Table 3-6. The proposed foundation type for a given project would be identified in the SAP.

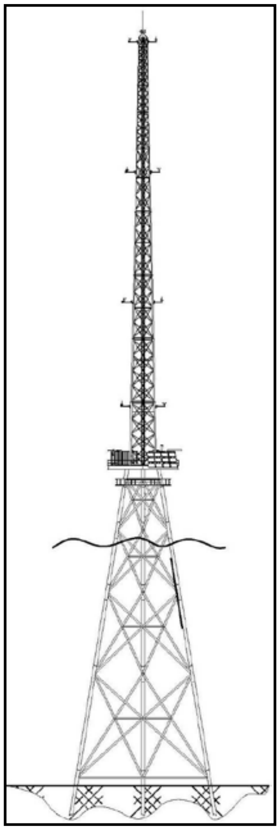

Figure 3-6a Lattice-type Mast-mounted Meteorological Tower on a Steel Jacket Foundation

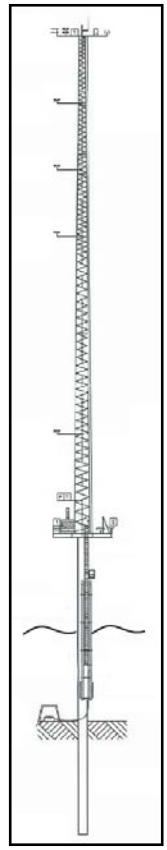

Figure 3-6b Lattice-type Mast-mounted Meteorological Tower on a Monopile Foundation

Source: Deepwater Wind, LLC, as cited in BOEM, 2012b.

Table 3-6
Meteorological Tower Foundations

	Number of Foundation Piles	Diameter of Foundation Piles (feet)	Area of Bottom Covered[1] (square feet)	Depth Driven below Seafloor (feet)	Height above MSL[2] (feet)
Tripod	3	10	1,500	25 to 100	295 to 377
Monopile	1	10	200	25 to 100	295 to 377
Steel Jacket	3 to 4	3	2,000	25 to 100	295 to 377

[1] Foundations may be surrounded by a scour system placed at the base of the structure that would cover up to 2 acres of ocean bottom.

[2] MSL = mean sea level

SAP Requirements for the Meteorological Tower

After a lease is issued and initial survey activities are conducted, the lessee may not install a meteorological tower until a SAP is submitted for review and approved by BOEM.

As part of the ESA Section 7 consultation process with NMFS for activities proposed in this EA, BOEM determined that site characterization activities, including buoy installation, are covered under the Biological Opinion (BO) issued for the G&G Final PEIS (NMFS, 2013a). On June 16, 2015, NMFS issued its letter of concurrence (see Appendix E) that site characterization activities including buoy installation were covered under the NMFS G&G BO (NMFS, 2013a). Upon receipt of a SAP from a lessee in North Carolina, BOEM will review the SAP to ensure it is wholly consistent with the NMFS G&G BO and identify if any activities in the survey plans are not covered by the NMFS G&G BO. If activities are proposed that are outside those covered by the NMFS G&G BO (e.g., meteorological tower construction), BOEM will initiate Section 7 consultation with NMFS for those activities.

Installation

Total installation time for one meteorological tower would take 8 days to 10 weeks, depending on the type of structure installed, the weather, and the sea state conditions (MMS, 2009b). Because of delays caused by weather and sea conditions, acquisition of permits, and availability of vessels, workers, and tower components, it is possible that installation may not occur during the first year of a lease and may be spread over more than one construction season. If installation occurs over two construction seasons, the foundation would likely be installed first with limited meteorological equipment mounted on the platform deck, and the mast and remaining equipment would be installed the following year (MMS, 2009b).

Installation – Onshore Activity

The meteorological tower platform would be fabricated onshore at an existing fabrication yard. Production operations would include cutting, welding, and assembling steel components. These yards occupy large areas with equipment including lifts and cranes, welding equipment, rolling mills, and sandblasting machinery. The locations of these fabrication yards are directly tied to the availability of a large enough channel that would allow the towing of these structures. The average bulkhead depth needed for water access to fabrications yards is 15 to 20 feet (5 to 6 meters). Therefore, platform fabrication yards must be located at deep-draft seaports or along the wider and deeper of the inland channels. Section 3.2.1.9 identifies the major ports that could support the fabrication of meteorological towers.

The meteorological tower could also be fabricated at various facilities or at inland facilities in sections and then shipped by truck or rail to the port staging area. The meteorological tower would then be partially assembled and loaded onto a barge for transport to the offshore site. Final assembly of the tower itself would be completed offshore (MMS, 2009b).

Installation – Offshore Activity

During installation, a radius of approximately 1,500 feet (162 acres) around the site would be needed for the movement and anchoring of support vessels. The following sections describe the installation of a foundation structure and tower. Several vessels would be involved with construction of a meteorological tower (see Table 3-7).

Installation of the Foundation Structure and Mast

A jacket or monopile foundation and deck would be fabricated onshore, then transferred to barge(s) and carried or towed to the offshore site.

The foundation piles would be driven anywhere from 25 to 100 feet (8 to 30 meters) below the seafloor with a pile driving hammer typically used in marine construction operations. Pile driving typically lasts 4 to 8 hours per day over 3 days for each tower (BOEM, 2014a). When the pile driving is complete after approximately 3 days, the pile driver barge would be removed. In its place, a jack-up barge equipped with a crane would be used to assist in the mounting of the platform decking, tower, and instrumentation onto the foundation. Depending on the type of structure installed and the weather and sea conditions, the in-water construction of the foundation pilings and platform would take a few days (monopole in good weather) to 6 weeks (jacket foundation in bad weather) (MMS, 2009b).

The mast sections would be raised using a separate barge-mounted crane; installation would likely be complete within a few weeks. The installation barges would be tended by appropriate tugs and workboats as needed. The types of vessels and number of trips to install one meteorological tower are listed in Table 3-7.

Table 3-7
Projected Vessel Usage and Specifications for the Construction of One Meteorological Tower

	Round Trips	Hours on the Site	Length in feet (meters)	Displacement (tons)	Engines (horsepower)	Fuel Capacity (gallons)
Crane barge	2	232	150–250 (46–76)	1,150	0	500
Deck cargo	2	232	150–270 (46–82)	750	0	0
Small cargo barge	2	232	90 (27)	154	0	0
Crew boat	21	54	51–57 (16–17)	100	1,000	1,800
Small tug boat	4	54	65 (20)	300	2,000	14,000
Large tug boat	8	108	95 (29)	1,300	4,200	20,000
Source: MMS, 2009b.						

Scour Control System

BOEM assumes that scour control systems would be installed if required to prevent seabed scour at the site. There are several types of scour control systems, including placement of rock armoring and mattresses of artificial (polypropylene) seagrass around foundation structures or underwater cabling. The type of scour control system used may vary depending on the seabed at a specific site and the meteorological tower foundation used.

A rock-armor scour protection system may be used to stabilize a structure's foundation area. In water depths greater than 15 feet (5 meters), the median stone size would be about 50 pounds with a stone layer thickness of about 3 feet (1 meter). If potential seabed scour is anticipated at the site, the foundation structure and a scour control system would occupy less than 1 acre. Rock armor for a wind turbine monopole foundation typically occupies 16,000 square feet (0.37 acre) of the seabed (ESS Group, 2004). Although the piles for a meteorological tower would be much smaller than those for a wind turbine, a meteorological tower may be supported by up to four piles. Therefore, using a conservative estimate, the maximum area of the seabed affected by rock armor for a single meteorological tower is also estimated to be 16,000 square feet (0.37 acre). The final foundation selection would be included in a detailed SAP submitted to BOEM along with the results of SAP-related site characterization surveys prior to BOEM consideration for approval.

Artificial seagrass mats are made of synthetic fronds that mimic seafloor vegetation to trap sediment. The mats become buried over time and have been effective for controlling scour in both shallow and deep waters (ESS Group, 2004). Scour monitoring at the Cape Wind meteorological tower indicated that a net increase of 12 inches of sand occurred where two artificial seagrass scour mats were installed. At another pile with artificial seagrass scour mats, there was a net scour depth of 7 inches. Both events occurred over a 3-year timeframe (Ocean and Coastal Consultants, 2006). If used, these mats would be installed by a diver or remotely operated underwater vehicle (ROV). Each mat would be anchored at eight to 16 locations, about 1 foot into the sand. It is estimated for a pile-supported platform that four mats, each about 8.2 by 16.4 feet (2.5 by 5 meters), would be placed around each pile. Including the extending sediment bank, a total area disturbance of about 5,200 to 5,900 square feet for a three-pile structure and 5,900 to 7,800 square feet (0.13 to 0.18 acre) for a four-pile structure is estimated. For a monopile, it is estimated that eight mats, about 16.4 by 16.4 feet (5 by 5 meters), would be used; there would be a total area disturbance of about 3,700 to 4,000 square feet (0.08 to 0.09 acre).

Operation and Maintenance

BOEM anticipates that a meteorological tower would be present for approximately 5 years before BOEM decides whether to allow the tower to remain in place for the commercial term of a lease or require that it be decommissioned immediately. This time period includes the period of 2 years that BOEM has to review the COP, during which time the meteorological tower could stay in place.

While the meteorological tower is in place, data would be collected and processed remotely; as a result, data cables to shore would not be necessary. The structure and instrumentation would be accessible by boat for routine maintenance. As indicated in previous site assessment proposals submitted to BOEM, lessees with towers powered by solar panels or small wind turbines would conduct monthly or quarterly vessel trips for operation and maintenance activity over the 5-year life of a meteorological tower (MMS, 2009b). However, if a diesel generator is used to power the meteorological tower's lighting and equipment, a maintenance vessel would make a trip at least once every other week, if not weekly, to provide fuel, change oil, and perform maintenance on the generator.

No additional or expansion of onshore facilities would be required to conduct these tasks. BOEM projects that crew boats would be used for routine maintenance and generator refueling, if diesel generators are used. The distance from shore would make vessels more economical than helicopters, so the use of helicopters to transport personnel or supplies during operation and maintenance is not anticipated.

Assumptions for Meteorological Tower Operations and Maintenance (O&M) activities are listed below:

- Duration: 5 years
- Scheduled Trips:
  - Solar or Wind-powered: Monthly
  - Diesel-powered: Weekly
- Crew Boats:
  - 51 to 57 feet (16 to 17 meters)
  - 400- to 1,000-horsepower engines and 1,800-gallon fuel capacity

Lighting and Marking

All meteorological towers and buoys, regardless of height, would have lighting and marking for navigational purposes. Meteorological towers and buoys would be considered Private Aids to Navigation, which are regulated by USCG under 33 CFR 66. A Private Aid to Navigation is a buoy, light, or day beacon owned and maintained by any individual or organization other than USCG. These aids are designed to allow individuals or organizations to mark privately owned marine obstructions or other similar hazards to navigation.

For meteorological towers that are taller than 199 feet (61 meters) and within 12 nm from shore, the lessee would be required to file a "Notice of Proposed Construction or Alteration" with the Federal Aviation Administration (FAA) per federal aviation regulations (14 CFR 77.13). FAA would then conduct an obstruction evaluation analysis to determine whether a meteorological tower would pose a hazard to air traffic, and would issue a Determination of Hazard/No Hazard. Currently, there are no specific FAA regulations or guidance on lighting and marking of ocean-based towers less than 200 feet (61 meters) tall (Edgett-Baron pers. comm. as cited in BOEM, 2014d). For this EA, it is assumed that the meteorological towers would be taller than 200 feet (61 meters). The Wilmington West WEA is located 10 nm from shore and could have a meteorological tower located within 12 nm from shore requiring an FAA Notice of Proposed Construction or Alteration.

Other Uses

The meteorological tower and platform could be used to gather other information in addition to meteorological information such as data regarding birds, bats, and marine mammals in the lease area.

Decommissioning

As late as 2 years after the cancellation, expiration, relinquishment, or other termination of the lease, the lessee would be required to remove all devices, works, and structures from the site and restore the leased area to its original condition before issuance of the lease (30 CFR 585, Subpart I). Lessees are required to submit a decommissioning application to BOEM for approval prior to starting decommissioning activities (30 CFR 585.902(b)).

BOEM estimates that the entire removal process for a meteorological tower would take 1 week or less (BOEM, 2012b). Decommissioning activities would begin with removal of all meteorological instrumentation from the tower, typically requiring a single vessel. A derrick barge would be transported to the offshore site and anchored adjacent to the structure. The mast would be removed from the deck and loaded onto the transport barge. The deck would be cut from the foundation structure. The same number of vessels necessary for installation would most likely be required for decommissioning. The sea bottom beneath installed structures would be cleared of all materials that have been introduced to the area in support of the lessee's project.

Cutting and Removing

As required by BOEM, the lessee would sever bottom-founded structures and their related components to at least 15 feet (5 meters) below the mudline to ensure that nothing would be exposed that could interfere with future leases and other activities in the area (30 CFR 585.910(a)). Which severing tool the operators use depends on the target size and type, water depth, economics, environmental concerns, tool availability, and weather conditions (MMS, 2005). Because of the type and size, piles of meteorological towers in the WEAs would be removed using non-explosive severing methods.

Common non-explosive severing tools that might be used consist of abrasive cutters (e.g., sand cutters, abrasive water jets), mechanical (carbide) cutters, diver cutting (e.g., underwater arc cutters, oxyacetylene/oxyhydrogen torches), and diamond wire cutters. Of these, the most likely tools to be employed would be an internal cutting tool, such as a high-pressure water jet-cutting tool that would not require the use of divers to set up the system or jetting operations to access the required mudline (Kaiser et al., 2005). To cut a pile internally, the sand that had been forced into the hollow pile during installation would be removed by hydraulic dredging/pumping and stored on a barge. Once cut, the steel pile would then be lifted on to a barge and transported to shore. Following the removal of the cut pile and the adjacent scour control system, the sediments would be returned to the excavated pile site using a vacuum pump and diver-assisted hoses. As a result, no excavation around the outside of the monopole or piles prior to the cutting is anticipated. Cutting and removing piles would take anywhere from several hours to 1 day per pile. After the foundation is severed, it would be lifted on the transport barge and towed to a decommissioning site onshore (MMS, 2009b).

Removal of the Scour Control System

Any scour control system would also be removed during the decommissioning process. Scour mats would be removed by divers or ROV and a support vessel in a similar manner to installation. Removal is expected to result in the suspension of sediments that were trapped in the mats. If rock armoring is used, armor stones would be removed using a clamshell dredge or similar equipment and placed on a barge. BOEM estimates that the removal of the scour control system would take a half day per pile. Therefore, depending on the foundation structure, removal of the scour system would take a total of 0.5 to 2 days to complete (MMS, 2009b).

Disposal

Unless portions of the meteorological tower are approved for use as artificial reefs, all materials would be removed by barge and transported to shore. The steel would be recycled and remaining materials would be disposed of in existing landfills in accordance with applicable law. Obsolete materials have been used as artificial reefs along the coastline of the United States to provide valuable habitat for numerous species of fish in areas devoid of natural hard bottom. The meteorological tower structures may also have the potential to serve as artificial reefs. However, the structure must not pose an unreasonable impediment to future development. If the lessee ultimately proposes to use the structure as an artificial reef, its plan must comply with the artificial reef permitting requirements of the U.S. Army Corps of Engineers (USACE) and the criteria in the National Artificial Reef Plan of 1985 (33 CFR 35.2103). The North Carolina Department of Environment and Natural Resources manages North Carolina's artificial reef program and must accept liability for the structure before BOEM would release the federal lessee from the obligation to decommission and remove all structures from the lease area.

3.2.2.2 Meteorological Buoy and Anchor System

Although a meteorological tower has been the traditional device for characterizing wind conditions, lessees could install meteorological buoys instead. Should a lessee choose to employ buoys instead of meteorological towers, this EA assumes that it would install a maximum of two buoys per lease. These meteorological buoys would be anchored at fixed locations and regularly collect observations from many different atmospheric and oceanographic sensors. Buoys would be equipped with generators holding approximately 250 gallons of fuel. The *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Revised Environmental Assessment* (BOEM, 2014c) evaluated various meteorological buoy and anchor systems, including hull type, height, and anchoring methods. Examples of the buoy and anchor systems are provided below. A meteorological buoy can vary in height, hull type, and anchoring method. NOAA has successfully used discus-shaped hull buoys (known as Naval Oceanographic and Meteorological Automated Devices, or "NOMADS") and the newest, the Coastal Buoy and the Coastal Oceanographic Line-of-Sight (COLOS) buoys, for weather data collection for many years (Figure 3-7).

USACE authorizes non-commercial, mooring buoys through an NWP 10 if the activities would cause only minimal adverse environmental and cumulative effects. The NWP 10 for mooring buoys is designed for administering compliance with the Rivers and Harbors Act and the Clean Water Act.

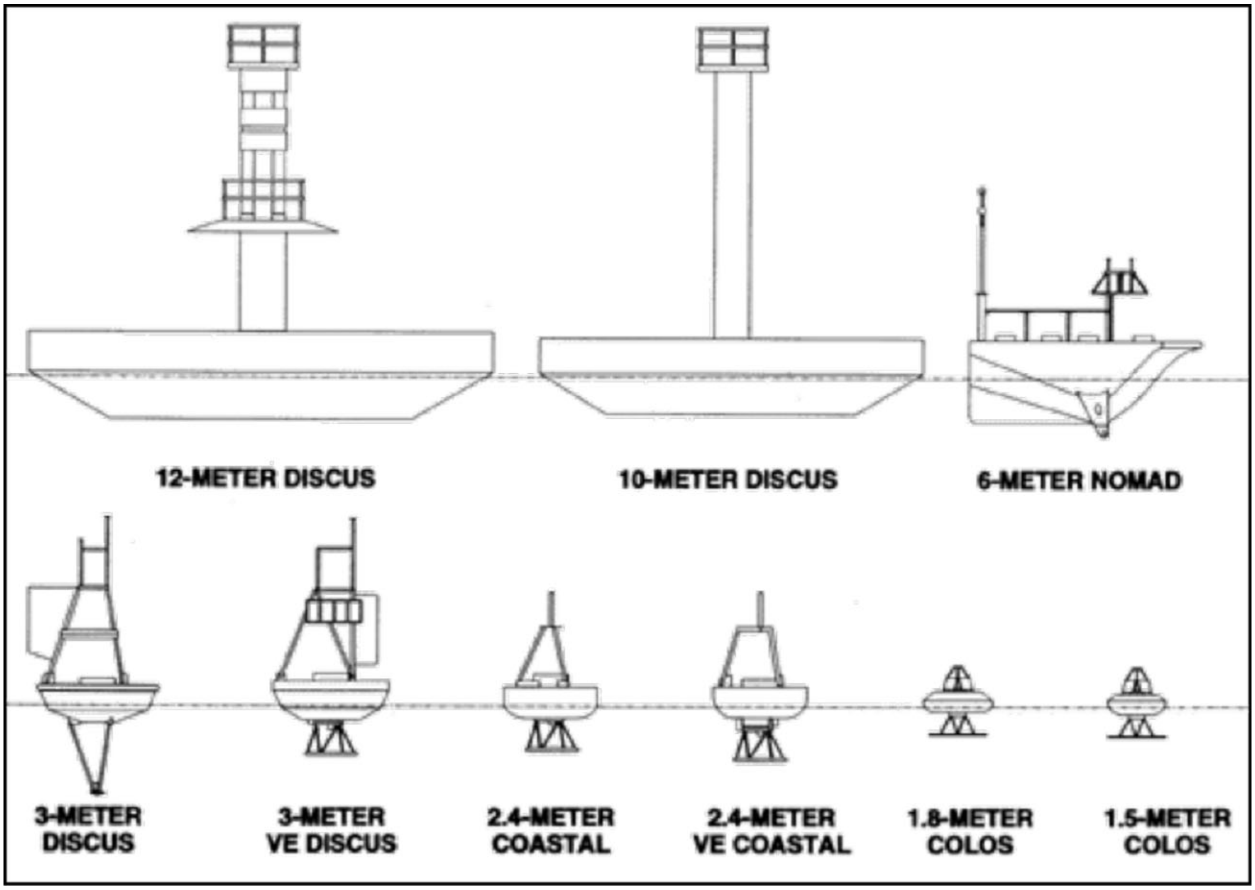

Figure 3-7 Buoy Schematic

Source: National Data Buoy Center, 2008.

The choice of hull type used usually depends on its intended installation location and measurement requirements. To ensure optimum performance, a specific mooring design is produced based on hull type, location, and water depth. For example, a smaller buoy in shallow coastal waters may be moored using an all-chain mooring. On the other hand, a large discus buoy deployed in the deep ocean may require a combination of chain, nylon, and buoyant polypropylene materials designed for many years of service (National Data Buoy Center, 2008).

Discus-shaped, boat-shaped, and spar buoys (Figures 3-8a through 3-8c) are the buoy types that would most likely be adapted for offshore wind data collection. A large discus-shaped hull buoy has a circular hull ranging between 33 and 40 feet (10 and 12 meters) in diameter and is designed for many years of service (National Data Buoy Center, 2006). The boat-shaped hull buoy is an aluminum-hulled buoy that provides long-term survivability in severe seas (National Data Buoy Center, 2006).

A buoy's specific mooring design is based on hull type, location, and water depth (National Data Buoy Center, 2006). Buoys can use a wide range of moorings to attach to the seabed. On the OCS, a larger discus-type or boat-shaped hull buoy may require a combination of a chain, nylon, and buoyant polypropylene materials designed for many years of ocean service.

Figure 3-8a 10-meter Discus-shaped Hull Buoy

Source: National Data Buoy Center, 2006

Figure 3-8b 6-meter Boat-shaped Hull Buoy

Source: National Data Buoy Center, 2006

Figure 3-8c Spar Buoy

Source: Australian Maritime Systems, 2012

Some deep ocean moorings have operated without failure for more than 10 years (National Data Buoy Center, 2006). The spar-type buoy can be stabilized through an on-board ballasting mechanism approximately 60 feet (18 meters) below the sea surface. Approximately 30 to 40 feet (9 to 12 meters) of the spar-type buoy would be above the ocean surface, where meteorological and other equipment would be located. Tension legs attached to a mooring by cables have been proposed for one spar-type buoy (Tetra Tech EC, Inc., 2012).

In addition to the meteorological buoys described above, a small tethered buoy (typically 10 feet [3 meters] in diameter or less) and/or other instrumentation could be installed on or tethered to a meteorological tower to monitor oceanographic parameters and collect baseline information on the presence of certain marine life.

Installation

Boat-shaped and discus-shaped buoys are typically towed or carried aboard a vessel to the installation location. Once at the location site, the buoy would be either lowered to the surface from the deck of the transport vessel or placed over the final location, and then the mooring anchor dropped. A boat-shaped buoy in shallower waters of the WEAs may be moored using an all-chain mooring, while a larger discus-type buoy would use a combination of chain, nylon, and buoyant polypropylene materials (National Data Buoy Center, 2006). Based on previous proposals, anchors for boat-shaped or discus-shaped buoys would weigh about 6,000 to 8,000 pounds with a footprint of about 6 square feet (0.5 square meter) and an anchor sweep of about 370,260 square feet (8.5 acres). After installation, the transport vessel would remain in the area for several hours while technicians configure proper operation of all systems. Buoys would typically take 1 day to install (see Table 3-8). Transport and installation vessel anchoring for 1 day is anticipated for these types of buoys (Fishermen's Energy, 2011).

Table 3-8
Spar-type Buoy Installation Phases

Installation Phases	Maximum Area of Disturbance	Transport Method	Total Time of Installation
Phase 1 – Deployment of clump anchor	484 square feet	barge	1 day
Phase 2 – Deployment of the spar buoy and connection to the clump anchor with mooring chain	784 square feet	barge	2 days
Source: Tetra Tech EC, Inc., 2010			

Based on the Garden State Offshore Energy proposal offshore New Jersey, a spar-type buoy would be towed to the installation location by a transport vessel after assembly at a land-based facility. In this example, the rectangular clump weight anchor is 22 by 22 by 3 feet in size and weighs approximately 100 tons (Tetra Tech EC, Inc., 2010). Once at the final location site, the buoy would be positioned vertically in the water column with a height from mean sea level to main deck of 36 feet and a highest mast point of approximately 52 feet. The maximum area of disturbance to benthic sediments occurs during anchor deployment and removal (e.g., sediment resettlement or sediment extrusion) for this type of buoy.

Onshore Activity

Onshore activity (fabrication, staging, or launching of crew/cargo vessels) related to the installation of buoys is expected to use existing ports that are capable of supporting this activity. Refer to Section 3.1.2 of this document for information pertaining to existing ports or industrial areas that would be used for meteorological buoys. No expansion of existing facilities would be necessary for the same reasons provided in the onshore activity section for meteorological towers, above.

Operation and Maintenance

Monitoring information that would be transmitted to shore would include systems performance information such as battery levels and charging systems output, the operational status of navigation lighting, and buoy positions. Additionally, all data gathered via sensors would be fed to an on-board radio system that transmits the data string to a receiver onshore

(Tetra Tech EC, Inc., 2010). On-site inspections and preventative maintenance (i.e., marine fouling, wear, or lens cleaning) are expected to occur on a monthly or quarterly basis. Periodic inspections for specialized components (i.e., buoy, hull, anchor chain, or anchor scour) would occur at different intervals, but would likely coincide with the monthly or quarterly inspection to minimize the need for additional boat trips to the site.

Because limited space would restrict the equipment that could be placed on a buoy, BOEM anticipates that this equipment would be powered by small solar panels or wind turbines instead of diesel generators. Weekly or bi-weekly vessel trips, which would be necessary for refueling generators on meteorological towers, are not projected for buoys.

Decommissioning

Decommissioning is basically the reverse of the installation process. Equipment recovery would be performed with support of a vessel(s) equivalent in size and capability to those used for installation (see section on installation above). For small buoys, a crane lifting hook would be secured to the buoy. A water/air pump system would de-ballast the buoy into the horizontal position. The mooring chain and anchor would be recovered to the deck using a winching system. The buoy would then be transported to shore by the barge.

Buoy decommissioning is expected to be completed within 1 day. Buoys would be returned to shore and disassembled or reused in other applications. BOEM anticipates that the mooring devices and hardware would be re-used or recycled as scrap iron (Fishermen's Energy, 2011).

3.2.2.3 Meteorological Tower and Buoy Equipment

Meteorological Data Collection

To obtain meteorological data, scientific measurement devices consisting of anemometers, vanes, barometers, and temperature transmitters would be mounted either directly on the tower or buoy or on instrument support arms. In addition to conventional anemometers, light detection and ranging (LiDAR), sonic detection and ranging (SODAR), and coastal ocean dynamic applications radar (CODAR) devices may be used to obtain meteorological data. LiDAR is a ground-based remote sensing technology that operates via the transmission and detection of light. SODAR is also a ground-based remote sensing technology; however, it operates via the transmission and detection of sound. CODAR devices use high-frequency surface wave propagation to remotely measure ocean surface waves and currents.

Ocean Monitoring Equipment

To measure the speed and direction of ocean currents, Acoustic Doppler Current Profilers (ADCPs) would most likely be installed on each meteorological tower or buoy. An ADCP is a remote sensing technology that transmits sound waves at a constant frequency and measures the ricochet of the sound wave off fine particles or zooplankton suspended in the water column. The ADCPs may be mounted independently on the seafloor or to the legs of the platform or attached to a buoy. A seafloor-mounted ADCP would most likely be located near the meteorological tower (within approximately 500 feet [152 meters]) and would be connected by a wire that is hand-buried into the ocean bottom.

A typical ADCP has three to four acoustic transducers that emit and receive acoustical pulses from different directions, with frequencies ranging from 300 to 600 kHz, with a sampling rate of 1 to 60 minutes. A typical ADCP is about 1 to 2 feet tall (0.3 to 0.6 meter) and 1 to 2 feet (0.3 to 0.6 meter) wide. Its mooring, base, or cage (surrounding frame) would be several feet wider.

Other Equipment

A meteorological tower or buoy could also accommodate environmental monitoring equipment, such as bird and bat monitoring equipment (e.g., radar units, thermal imaging cameras), acoustic monitoring equipment for marine mammals, data logging computers, power supplies, visibility sensors, water measurement equipment (e.g., temperature, salinity), communications equipment, material hoist, and storage containers.

3.2.2.4 Vessel Traffic Associated with Site Assessment

Vessel trips would be associated with all phases of site assessment (installation, decommissioning, and routine maintenance). As explained in Section 3.1.2, there are three major ports in the region that are likely to be used to support site assessment activities for the proposed action. The site assessment trips would add vessel traffic in already heavily used waterways (see Section 4.4.3.3).

Based on previous site assessment proposals submitted to BOEM, up to about 40 round trips by various vessels are expected during construction of each meteorological tower (see Table 3-5). Should each potential lessee decide to install a meteorological tower on its leasehold, a total of 120 round trips are estimated for construction (40 trips per tower multiplied by 3 towers [see Table 3-6]). These vessel trips may be spread over multiple construction seasons as a result of the various times at which lessees acquire their leases, weather and sea state conditions, the time to assess suitable site(s), the time to acquire the necessary permits, and the availability of vessels, workers, and tower components. Because the decommissioning process would basically be the reverse of construction, vessel usage during decommissioning would be similar to vessel usage during construction, so another 120 round trips are estimated for decommissioning of towers. Meteorological buoys would typically take 1 to 2 days for one vessel to install and 1 to 2 days for one vessel to decommission.

Maintenance trips to each meteorological tower may occur weekly to quarterly, and monthly to quarterly for each buoy. However, to provide for a conservative scenario, total maintenance vessel trip calculations are based on weekly trips for towers and monthly trips for buoys over the entire 5-year period (Table 3-9).

The total vessel traffic estimated as a result of the installation, decommissioning, and routine maintenance of the meteorological towers/buoys that could be anticipated in connection with the proposed action is anticipated to be between 300 and 1,020 round trips over a 5-year period (Table 3-9).

Table 3-9
Projected Maximum Vessel Trips for the Proposed Action (Alternative A)
Site Assessment Activities

Site Assessment Activity	Round Trips	Formula
Meteorological Buoys		
Meteorological Buoy Installation	6–12	1–2 round trip × 6 buoys
Meteorological Buoy Quarterly–Monthly Maintenance Trips	120–360	4 quarters × 6 buoys × 5 years – 12 months × 6 buoys × 5 years
Meteorological Buoy Decommission	6–12	1–2 round trip × 6 buoys
Total Buoy Trips over 5-Year Period	132–384	N/A
Meteorological Towers		
Meteorological Tower Construction	120	40 round trips × 3 towers
Meteorological Tower Quarterly–Weekly Maintenance Trips[1]	60–780	4 quarters × 3 towers × 5 years – 52 weeks × 3 towers × 5 years
Meteorological Tower Decommission	120	40 round trips × 3 towers
Total Tower Trips over 5-Year Period	300–1,020	N/A

[1] Although construction and decommissioning would occur during some of the weeks and, therefore, not all weeks would require maintenance trips for the towers, all weeks were included for maintenance to be conservative in the trip calculations.

3.2.2.5 Noise Generation

Noise would be generated by the following activities and equipment under Alternative A.

- HRG survey equipment,
- Drilling and sediment sample collection as part of G&G surveys,
- Vessel engines during site characterization surveys and meteorological tower installation, O&M, and decommissioning,
- Installation of meteorological towers, including pile driving, and
- Diesel engines on meteorological towers where solar/wind are not used for power.

The HRG survey equipment that would most likely be used, along with the associated noise level, is listed in Table 3-10. The G&G Final PEIS (BOEM, 2014a) evaluated potential impacts of noise generated from G&G activities, including HRG equipment, drilling and sediment surveys, and characterization surveys (including drilling and sediment sample collection) and concluded the following, which is incorporated into this EA by reference.

Table 3-10
Typical High-Resolution Geophysical Survey Equipment

Source	Pulse Length	Broadband Source Level (dB re 1 µPa at 1 m)	Operating Frequencies
Boomer	180 µs	212	200 Hz–16 kHz
Side-scan sonar	20 ms	226	100 kHz
			400 kHz
CHIRP sub-bottom profiler	64 ms	222	3.5 kHz
			12 kHz
			200 kHz
Multi-beam depth sounder	225 µs	213	240 kHz

Source: BOEM, 2013e

CHIRP = Compressed High Intensity Radar Pulse, µPa = micropascal, µs = microsecond, ms = millisecond, Hz = hertz, kHz = kilohertz, dB re 1 µPa at 1 m = source level, received level measured or estimated 3 feet (1 meter) from the source

Table 3-10 provides a list of typical equipment used in high-resolution marine site surveys and their acoustic intensity. This table is representative of the types of equipment that BOEM has received in draft project plans submitted under Interim Policy leases in Delaware and New Jersey. Actual equipment used could have frequencies and/or sound pressure levels (SPL) somewhat below or above those indicated in Table 3-10. This scenario does not assume the use of any air guns that are used for deeply penetrating two-dimensional or three-dimensional exploratory seismic surveys to determine the location, extent, and properties of oil and gas resources.

3.3 Non-Routine Events

Potential non-routine events and hazards that could occur during data collection activities are (1) severe storms such as hurricanes and extratropical cyclones; (2) collisions between the structure or associated vessels and other marine vessels or marine life; and (3) spills from collisions or during generator refueling. These events and hazards are summarized below.

3.3.1 Storms

Severe weather events have the potential to cause structural damage and injury to personnel. Major storms, winter nor'easters, and hurricanes pass through the area regularly, resulting in elevated water levels (storm surge) and high waves and winds. Storm surge and wave heights from passing storms are worse in shallow water and along the coast but can pose hazards in offshore areas.

In the vicinity of the Wilmington West and Wilmington East WEAs, data collected between 2003 and 2008 from a National Data Buoy Center buoy located near Frying Pan Shoals (Buoy 41013, located at 33°26'11"N, 77°44'35"W) showed that average wind speeds are typically lowest in July and August, at approximately 11 to 12 knots, and highest in February, at approximately 16 knots (National Data Buoy Center, 2012).

In the vicinity of the Kitty Hawk WEA, data collected between 1980 and 1995 from a National Data Buoy Center buoy located northeast of Nags Head, NC (Buoy 44006, located at 36°17'60"N, 75°24'0"W) showed that average wind speeds are typically lowest in May, June, and July, at approximately 9 to 10 knots, and highest in December and January, at approximately 14 to 15 knots (National Data Buoy Center, 2012).

The highest winds are associated with tropical cyclones (i.e., hurricanes), which are a relatively common threat in the region of the WEAs. The Atlantic Ocean hurricane season is June 1 to November 30, with a peak in September. On average, there are approximately 11 storms of tropical storm strength or greater per year in the Atlantic basin; about half reach hurricane level and approximately two and a half of these storms become major hurricanes (Category 3 or higher) (NOAA, 2012). From 1851 to 2010, a reported 51 hurricanes struck the North Carolina coastline, 12 of which were major (Blake et al., 2011). From 1900–2010, Brunswick County, the county associated with both the Wilmington West and Wilmington East WEAs, has been struck by major hurricanes four times. The counties in the vicinity of the Kitty Hawk WEA, Currituck and Dare, were struck by major hurricanes four and nine times, respectively (NOAA, 2012). Blake et al. (2011) also estimated the return period, in years, of all hurricanes (winds greater than or equal to 64 knots) passing within 50 nm of various locations along the U.S. coast. In the region of the WEAs, the return period for such an event is listed as 5 to 7 years, while the return period for a major (Category 3 or greater) hurricane, in the same location, is 16 to 18 years.

3.3.2 Allisions and Collisions

A meteorological tower or buoy in the WEAs could pose a risk to both vessel and aviation navigation. An allision between a ship or an airplane and a meteorological structure could result in the loss of the entire facility and/or the vessel/airplane, as well as loss of life and spillage of diesel fuel. If a vessel hits a buoy system, it could damage the buoy hull so the buoy loses its buoyancy and sinks or could damage the equipment or its supporting structure. Because a buoy would protrude from the ocean surface only 30 to 40 feet (9 to 12 meters), an airplane striking a buoy is unlikely. Vessels associated with site characterization and assessment activities could collide with other vessels and experience accidental capsizing or result in a diesel spill.

Vessel collisions and allisions are less likely to happen because vessel traffic is controlled by multiple routing measures, such as safety fairways, TSSs, and anchorages. In a recent study, it was estimated that a spill could occur once per month within the North Carolina Call Areas from vessel allisions, causing a small release of up to several hundred gallons; within the WEAs, the probability of a catastrophic spill[1] would be very low (occurring approximately once in over 1,000 years) (Bejarano et al., 2013). Airplane collisions and allisions are also considered unlikely. BOEM anticipates that aerial surveys would not be conducted during periods of storm

[1] A catastrophic spill is categorized as a spill involving oil totaling 129,000 gallons or more or a chemical release totaling 29,000 gallons or more (Bejarano et al., 2013).

activity because the reduced visibility conditions would not meet visibility requirements for conducting the surveys, and flying at low elevations would pose a safety risk during storms and times of low visibility. Risk of allisions with meteorological towers and buoys for both vessels and aviation would be further reduced by USCG-required marking and FAA-required lighting.

Historical data support that the number of potential allisions and collisions resulting in major damage to property and equipment would be small. Major damage is defined as greater than $25,000 worth of damage. Allision and collision incident data were reviewed for the years 1996 through 2010 (BOEM, 2011c) for the Gulf of Mexico and Pacific regions, which contain many fixed structures on the OCS like the meteorological facilities that would be installed in the WEAs. O&M activities on the meteorological facilities in the WEAs would be similar to what is needed for fixed structures in the Gulf of Mexico and Pacific regions. Over a 15-year period with over 4,000 structures installed at any one time, 197 allisions and collisions were reported in the Gulf of Mexico and Pacific regions; this number includes reports of all major damages and some, but not all, minor damages (less than $25,000 in damages). The most commonly reported causes of the allisions and collisions include human error, weather-related causes, equipment failure on the vessels, and navigational aids not working on the structures.

3.3.3 Spills

A diesel spill could occur as a result of allisions, collisions, accidents, or natural events. If a vessel collision occurs and the collision leads to major hull damage, a diesel spill could occur. The amount of diesel fuel that could be released by a marine vessel involved in a collision would depend on the type of vessel and severity of the collision. From 2000 to 2009, the average spill size for vessels other than tank ships and tank barges was 88 gallons (USCG, 2011); should the proposed action result in a spill in any given area, BOEM anticipates that the average volume would be the same. The most likely types of releases from vessel allisions could be up to a few thousand gallons of oils and would cause minimal, temporary environmental consequences limited to the vicinity of the point of release; however, the probability of these types of releases is very small (Bejarano et al., 2013).

Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills. Most equipment on the meteorological towers and buoys would be powered by batteries charged by small wind turbines and solar panels. However, diesel generators may be used on some of the anticipated meteorological towers. Minor diesel fuel spills may also occur during refueling of generators.

Impacts would depend greatly on the material spilled (diesel fuel in the related vessel and infrastructure types), the size and location of a spill, the meteorological conditions at the time of the spill, and the speed with which cleanup plans and equipment could be employed. Diesel fuel is a refined petroleum product that is lighter than water. It may float on the water's surface or be dispersed into the water column by waves. Diesel is a distillate of crude oil and does not contain the heavier components that contribute to crude oil's longer persistence in the environment. If a diesel spill were to occur, it would be expected to dissipate very rapidly and would then evaporate and biodegrade within a few days (MMS, 2007b).

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4. ENVIRONMENTAL AND SOCIOECONOMIC CONSEQUENCES

4.1 Definitions of Impact Levels

The conclusions for most analyses in this EA use a four-level classification scheme (negligible, minor, moderate, and major) to characterize the environmental impacts predicted if the proposed action or an alternative is implemented. Definitions of impacts are presented in two separate groups: one for biological and physical resources and one for socioeconomic resources. The CEQ interprets the human environment "to include the natural and physical environment and the relationship of people with that environment" (40 CFR 1508.14).

BOEM used the definitions in Section 4.1.1 originally developed in its PEIS (MMS, 2007a) to provide consistency in its discussion of impacts. BOEM continues to refine these definitions as part of its NEPA decision-making process.

4.1.1 Impact Levels for Biological and Physical Resources

The following impact levels definitions are used for biological and physical resources. For biota, these levels are based on population-level impacts rather than impacts on individuals.

Negligible

- No measurable impacts.

Minor

- Most impacts on the affected resource could be avoided with proper mitigation.
- If impacts occur, the affected resource would recover completely without any mitigation once the impacting agent is eliminated.

Moderate

- Impacts on the affected resource are unavoidable.
- The viability of the affected resource is not threatened although some impacts may be irreversible, or the affected resource would recover completely if proper mitigation is applied during the life of the project or proper remedial action is taken once the impacting agent is eliminated.

Major

- Impacts on the affected resource are unavoidable.
- The viability of the affected resource may be threatened, and the affected resource would not fully recover even if proper mitigation is applied during the life of the project or remedial action is taken once the impacting agent is eliminated.

4.1.2 Impact Levels for Socioeconomic Issues

The following impact levels are used for the analysis of socioeconomic resources.

Negligible

- No measurable impacts.

Minor

- Adverse impacts on the affected activity or community could be avoided with proper mitigation.
- Impacts would not disrupt the normal or routine functions of the affected activity or community.
- Once the impacting agent is eliminated, the affected activity or community would return to a condition with no measurable effects without any mitigation.

Moderate

- Impacts on the affected activity or community are unavoidable.
- Proper mitigation would reduce impacts substantially during the life of the project.
- The affected activity or community would have to adjust somewhat to account for disruptions due to impacts of the project, or once the impacting agent is eliminated, the affected activity or community would return to a condition with no measurable effects if proper remedial action is taken.

Major

- Impacts on the affected activity or community are unavoidable.
- Proper mitigation would reduce impacts somewhat during the life of the project.
- The affected activity or community would experience unavoidable disruptions to a degree beyond what is normally acceptable, and once the impacting agent is eliminated, the affected activity or community may retain measurable effects indefinitely, even if remedial action is taken.

4.2 Other NEPA Reviews Incorporated by Reference

As previously discussed, other NEPA reviews were completed by BOEM for the same types of resources in the same geographic area as part of the G&G Final PEIS (BOEM, 2014a) and the Programmatic EIS for OCS Alternative Energy. See Section 1.5 for a more complete discussion of the supporting NEPA evaluations referenced in the following impact analyses.

4.3 Resources Eliminated from Further Consideration

NEPA requires issues (resource areas) that are significant to the action be the focus of the analysis. Because many of the activities described in this EA have been previously analyzed the G&G Final PEIS (BOEM, 2014a) as well as the list of EAs discussed in Section 1.5, resource areas of concern for site characterization activities such as those proposed in this EA have been well documented. Therefore, the following resource areas will not be carried forward for analysis in this EA.

4.3.1 Geology and Soils

The potential impacts on sediments from deep stratigraphic and shallow test drilling and bottom sampling would only have minor impacts on geology and soils off the coast of North Carolina. These resources were previously evaluated in the G&G Final PEIS (BOEM, 2014a) and are hereby incorporated by reference (Section 4.1.1). Disturbance associated with the installation of meteorological towers would affect the sediments on the seafloor at a maximum radius of 1,500 feet (~450 meters), or 162 acres around each bottom-founded structure including all anchorages and appurtenances of the support vessels. This would result in a total of almost 486 acres of affected seafloor in all the WEAs, or less than 0.2% of the total area of all WEAs, if all three meteorological towers were installed and they each disturbed the maximum foreseeable area of seafloor. This would create negligible impacts on the geology and soil of the seafloor associated with the construction of the meteorological tower.

4.3.2 Physical Oceanography

Physical oceanography from survey vessels and floating platforms off the coast of North Carolina would not be affected. Ocean current characteristics, water column density stratification, and vertical current structure, among other factors, would be considered during the planning and as part of the SAP approval. Operation and data post-processing of survey or sampling efforts were previously evaluated in the G&G Final PEIS (BOEM, 2014a) and are hereby incorporated by reference (Section 4.1.1). Construction of meteorological towers would affect a small portion of the seafloor at a maximum radius of 1,500 feet (~450 meters), or 162 acres around each bottom-founded structure including all anchorages and appurtenances of the support vessels. With the exception of the meteorological tower foundations, these would be temporary seafloor impacts and only small areas within each radius would be affected by anchorages and appurtenances at one time. As discussed in Section 3.2.2.3, the total area of seafloor affected by the foundation and rock armoring is anticipated to be 0.37 acre or less for rock armor and 0.05 acre or less for each foundation in each WEA. The total area of all WEAs, if all three meteorological towers were installed and they each disturbed the maximum foreseeable area of seafloor, would be less than 2 acres. This is a small area that would result in negligible, if any, impacts on ocean currents, water column density, or other physical oceanographic characteristics.

4.4 Alternative A – The Proposed Action

4.4.1 Physical Resources

4.4.1.1 Air Quality

Air quality impacts that could result from site characterization activities under Alternative A were evaluated in the G&G Final PEIS (BOEM, 2014a), and impacts on air quality were found to be negligible; these analyses and findings are incorporated into this EA by reference. The following sections present a more area-specific evaluation of air quality impacts associated with G&G activities, along with an evaluation of air impacts associated with site assessment activities (i.e., meteorological towers or buoys).

Description of the Affected Environment

Air Quality Standards and Regulations

The Clean Air Act of 1970 (42 U.S.C. § 7401 *et seq*., as amended) directed EPA to establish National Ambient Air Quality Standards (NAAQS) for air pollutants that EPA has listed as "criteria" pollutants because there was adequate reason to believe that their presence in the ambient air "may reasonably be anticipated to endanger public health and welfare." The NAAQS apply to sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, particulate matter (PM10 and PM2.5 [particulate matter with aerodynamic diameters of 10 microns or less and 2.5 microns or less, respectively]), and lead (40 CFR 50). EPA sets the primary NAAQS at levels to protect public health with an adequate margin of safety, and the secondary NAAQS at levels to protect public welfare. All of the standards are expressed as concentrations in air and duration of exposure. Many standards address both short- and long-term exposures. When the monitored pollutant levels in an area of a state are within the NAAQS for any pollutant, EPA classifies that area as "attainment" for that pollutant. When monitored pollutant levels exceed the NAAQS, the area is classified as "nonattainment." Former nonattainment areas that have achieved attainment are classified as "maintenance" areas. All of the counties that may be affected by emissions associated with Alternative A (i.e., the coastal counties nearest the WEAs) meet the NAAQS and are classified as attainment areas, except for portions of the Norfolk, VA, region (EPA, 2014a). In the Norfolk region, Chesapeake County, Norfolk County, Portsmouth County, and Virginia Beach County are classified as maintenance for ozone and attainment for all other pollutants.

The *Visibility Protection* and *Prevention of Significant Deterioration* provisions of the Clean Air Act (Sections 169A and 162, respectively) protect certain lands designated as mandatory federal Class I areas (e.g., national parks and wilderness areas) because air quality is a special feature of the area. Very little degradation of air quality, including air quality-related values such as visibility, is allowed in Class I areas. In general, if a project is located within 100 kilometers (62 miles) of a Class I area, its impacts on concentrations of criteria pollutants in the Class I area should be determined (EPA, 1992). In addition to criteria pollutant concentrations, damage to plants and ecosystems from ozone and PM2.5, visibility or regional haze, and acidic deposition are of concern in Class I areas. The closest Class I areas to the project are the Swanquarter National Wildlife Refuge (NWR) near Bath, NC and the Cape Romain NWR near Awendaw, SC (NCDENR, 2012). The Swanquarter NWR is located approximately 100 miles southwest of the Kitty Hawk WEA and 150 miles north of the Wilmington East and West WEAs. The Cape Romain NWR is located approximately 90 miles southwest of the Wilmington West WEA, 110 miles southwest of the Wilmington East WEA, and 350 miles southwest of the Kitty Hawk WEA. The Swanquarter NWR and the Cape Romain NWR Class I areas are too distant to be affected by emissions occurring in or near the WEAs. Boats associated with the project traveling near shore could produce emissions at lesser distances for short periods as they pass the Class I areas. Emissions from the boats would be too small to affect air quality in the Class I areas.

Meteorology

The prevailing wind directions are quite consistent, with two dominant wind directions: winds from March through August are from the southwest, while winds from September through February are slightly stronger and from the northeast. For low-pressure systems tracking northward along the east coast, easterly flow can develop ahead of the storms, with strong onshore winds in the coastal zone followed by westerly or northwesterly winds after the system passes by to the north. Average surface wind speeds offshore are in the range of about 7 to 9 meters per second. Average wind speeds decrease in the shoreward direction to a range of about 4 to 6 meters per second in coastal land areas (UNC, 2009).

A common meteorological feature along coastal areas is the "sea breeze." During the day the land tends to heat up faster than the water, leading to higher air temperatures over the land surface than over the water surface. During the night the land cools faster than the water, leading to lower air temperatures over the land surface than over the water surface. Due to these temperature differences, a circulation system develops in which the air nearest the surface flows offshore during the night and onshore during the day (BOEM, 2014d).

The sea breeze circulation can affect air quality because it can cause recirculation of pollutants. Emissions generated early in the day may be carried offshore and then may be carried back onshore by the sea breeze (BOEM, 2014d). The sea breeze can contribute to increased ozone concentrations onshore because emissions of precursor pollutants (primarily nitrogen oxides and volatile organic compounds) can be transported offshore in the morning and can form ozone while over the ocean, and then the afternoon sea breeze can transport the ozone back over land.

Air Quality Measurements

State air quality agencies maintain networks of monitoring sites to measure air pollutant concentrations. In the coastal region, monitoring sites are located in the Hampton/Norfolk, VA area, the Wilmington, NC area, Bath (Beaufort County), NC, Georgetown (Georgetown County), SC, the Cape Romain NWR, SC, and the Charleston, SC area. Measurements from these sites through 2013 indicate that criteria pollutant levels are within the NAAQS throughout the coastal region. Concentrations generally have been declining since approximately 2000 (VADEQ, 2013; NCDENR, 2011; SCDEHC, 2014; EPA, 2014b).

Regulatory Controls on OCS Activities that Affect Air Quality

Section 328 of the Clean Air Act Amendments of 1990 directs EPA to promulgate regulations for OCS sources that may affect the air quality of any state (42 U.S.C. § 7627). The regulations are found in 40 CFR 55, which provides EPA with the authority to regulate the air emissions associated with OCS sources. OCS sources would include meteorological towers, any vessels for the purposes of constructing, servicing, or decommissioning them, and seafloor boring. Under the EPA rules, for all OCS sources within 25 nm of states' seaward boundaries, the requirements are the same as would be otherwise applicable if the source were located in the corresponding onshore area (40 CFR 55.3). In the states potentially affected by Alternative A, the state seaward boundaries extend 3 nm from the coastline.

Section 328 also establishes a unique treatment for vessels associated with OCS facilities. With respect to calculations of a facility's Potential to Emit, EPA considers emissions from vessels that are servicing or associated with the operations of OCS facilities as direct emissions from the OCS source when those vessels are at the source or en route to or from the source, as long as they are within 25 nm of the source (40 CFR 55.2).

Impact Analysis of Alternative A

Routine Activities and Events

Emissions Sources

Air emissions sources potentially associated with Alternative A include:

- Emissions from vessels used for:
  - Site characterization surveys
  - Site assessment (i.e., construction, O&M, and decommissioning of meteorological towers/buoys)
- Emissions from onshore vehicles and equipment:
  - Heavy-duty trucks
  - Worker commuting vehicles
  - Construction equipment used in construction of meteorological towers
- Diesel engines used to operate meteorological towers/buoys

The types of air pollutants emitted would include the criteria pollutants and greenhouse gas emissions (e.g., carbon dioxide).

Assumptions

Emissions of criteria air pollutants from the site characterization surveys and site assessment activities were calculated to estimate the reasonably foreseeable scenario for emissions in any given year of the 5-year period.

The following assumptions were made to provide a representative evaluation of potential air impacts:

- Round-trip vessel mileage is based on the distance from representative ports to the mid-point of the WEAs.
- Because the precise timing of operations cannot be known at present, total round-trip travel was divided equally over the 5-year period.
- Boats (rather than aircraft) would be used for the avian surveys.
- Power to operate meteorological towers/buoys would be provided by diesel engines (rather than solar or wind).
- All meteorological towers would be constructed in the same year.
- Meteorological towers would be constructed and would operate concurrently over a 5-year period.

- Activities under Alternative A would occur simultaneously with other navigation/vessel traffic that frequents the same waters and airways.
- The impacts of miscellaneous activities onshore would be considered negligible because of the temporary duration compared to the existing industrial activities/production operations already occurring at the fabrication yards.

Site Characterization (Surveys and G&G Activities)

Increased vessel traffic associated with site characterization surveys would add to current vessel traffic levels associated with the ports used by the vessel operators. The additional vessel activity associated with Alternative A is anticipated to be relatively small when compared with existing and future vessel traffic levels in the area. Impacts from pollutant emissions associated with these vessels would likely be localized within the WEAs and in the vicinity of vessel activity. Appendix C provides further information on the anticipated numbers of project-related vessel trips.

Site Assessment Activities (Construction and Operation of Towers and Buoys)

Increased vessel traffic associated with construction/installation, operation and maintenance, and decommissioning of meteorological towers and/or buoys would add to current vessel traffic levels associated with the ports used by the vessel operators. The additional vessel activity associated with Alternative A is anticipated to be relatively small when compared with existing and future vessel traffic levels in the area (see Section 4.4.3.3, *Navigation/Vessel Traffic*, for existing traffic levels). Impacts from pollutant emissions associated with these vessels would most likely be localized within the WEAs and in the vicinity of vessel activity. Appendix C provides further information on the anticipated numbers of project-related vessel trips.

The onshore area of Norfolk is classified as a maintenance area for ozone. Nonattainment and maintenance areas are subject to the EPA General Conformity Rule (40 CFR 93, Subpart B). The rule establishes emissions thresholds for use in evaluating a project's conformity with the applicable State Implementation Plan. The State Implementation Plan for the Norfolk maintenance area describes the region's program to maintain compliance with the ozone NAAQS. If the net increases in emissions due to a project are lower than the thresholds (for the Norfolk area, 100 tons per year of nitrogen oxides or volatile organic compounds), the project is presumed to conform, and no further conformity evaluation is necessary. If the net emissions increases exceed these thresholds, a formal conformity determination may be required. If a submitted SAP indicates that project-related activities in the Norfolk maintenance area would emit more than the thresholds, then a General Conformity analysis would be performed.

Emissions associated with a buoy would be much lower than those associated with a tower because buoys are towed or carried aboard a vessel and then anchored to the seafloor. No drilling equipment would be required to install meteorological buoys. Each installation and decommissioning of a meteorological buoy can be completed in approximately 1 to 2 days, respectively, which involves one round trip (Section 3.2.2.2). This is well below the number of trips required for tower installation and, therefore, emissions associated with construction and decommissioning the number of projected meteorological buoys would also be lower than for towers.

Estimated Emissions

Emissions were estimated for site characterization surveys and site assessment activities, using approved emission factors and conservative assumptions. The numbers of vessel trips are provided in Appendix C. All emissions calculations, along with the assumptions used to complete the calculations, are provided in Appendix D. Table 4-1 shows the estimated emissions by alternative.

Non-Routine Events

The most likely impact on air quality within the WEAs or along the cable routes from non-routine events would be caused by vapors from fuel spills resulting from either vessel collisions or from servicing or refueling generators that may be located on the meteorological towers. If a vessel spill occurred, the estimated spill size would be approximately 88 gallons (Section 3.3.3). If such a spill were to occur, it would be expected to dissipate rapidly and then evaporate and biodegrade within a few days (MMS, 2007a). A diesel spill occurring in the WEAs would not be expected to have impacts on onshore air quality because of the estimated size of the spill, prevailing atmospheric conditions over the WEAs, and distance from shore.

Although unlikely, a spill could occur in the event of vessel collision while en route to and from the WEAs or during surveys. Spills occurring in these areas, including harbor and coastal areas, are not anticipated to have significant impacts on onshore air quality due to the small estimated size and short duration of the spill.

Conclusion

Results from this analysis indicate **negligible** impacts on air quality. Air pollutant concentrations due to emissions from the project would not be expected to lead to any violation of the NAAQS. Class I air quality areas are too distant to be affected by emissions from project activities. These findings are consistent with those of the G&G Final PEIS (BOEM, 2014a), which also concluded negligible impacts and is incorporated here by reference.

Table 4-1
Air Pollutant Emissions (Tons per Year, Metric Tons per Year for Greenhouse Gases) in a Single Year

Action Alt.	Activity	CO	NO_X	VOCs	PM10	PM2.5	SO_X	CO_2	N_2O	CH_4	CO_2e
A	Site Characterization Surveys	3.50	37.99	1.46	2.07	2.07	3.74	1,828.78	0.05	0.24	1,900.47
	Site Assessment: Construction of Meteorological Towers[a]	0.36	2.11	0.43	0.14	0.14	0.20	131.33	0.003	0.04	144.39
	Site Assessment: Operation of Meteorological Towers	4.03	22.04	1.85	1.47	1.47	1.64	790.99	0.01	0.04	801.83
	Site Assessment: Decommissioning of Meteorological Towers[a]	0.36	2.75	0.44	0.16	0.17	0.27	164.32	0.00	0.04	176.07
	Sum of emissions from all sources[b] – Alt. A	**8.26**	**64.89**	**4.18**	**3.85**	**3.85**	**5.86**	**2,915.42**	**0.07**	**0.35**	**3,022.77**
B	Site Characterization Surveys	2.00	21.45	0.83	1.17	1.17	2.11	1,036.74	0.03	0.13	1077.28
	Site Assessment: Construction of Meteorological Towers[a]	0.29	1.99	0.41	0.13	0.13	0.19	115.38	0.003	0.03	125.19
	Site Assessment: Operation of Meteorological Towers	2.69	14.70	1.34	0.98	0.98	1.10	527.33	0.01	0.02	534.55
	Site Assessment: Decommissioning of Meteorological Towers[a]	0.24	1.83	0.40	0.11	0.11	0.18	109.54	0.00	0.03	117.38
	Sum of emissions from all sources[b] - Alt. B	**5.22**	**39.97**	**2.97**	**2.39**	**2.39**	**3.58**	**1,788.99**	**0.04**	**0.22**	**1,854.41**
C	All		All values same as Alternative A								

Action Alt.	Activity	CO	NO_X	VOCs	PM10	PM2.5	SO_X	CO_2	N_2O	CH_4	CO_2e

[a] Also serves as a conservative (high) estimate for construction, deployment, and decommissioning of meteorological buoys and equipment.

[b] Sum of individual values may not equal summary value because of rounding.

CO = carbon monoxide, NO_X = nitrogen oxides, VOCs = volatile organic compounds, PM10 = particulate matter with aerodynamic diameters of 10 microns or less, PM2.5 = particulate matter with aerodynamic diameters of 2.5 microns or less, SO_X = sulfur oxides, CO_2 = carbon dioxide, N_2O = nitrous oxide, CH_4 = methane, CO_2e = carbon dioxide equivalent

4.4.1.2 Water Quality

Description of the Affected Environment

The affected environment encompasses the coastal waters that could be affected by Alternative A (e.g., traversed by vessels during site characterization and assessment activities) including all the ports/harbors, rivers, bays, and estuaries. It also includes the marine waters offshore that are state territory (within three nm of shore) as well as those within the OCS in the WEAs and on the path to and from the WEAs from shore. Chapter 4.2.4 of the G&G Final PEIS (BOEM, 2014a) describes coastal and marine water quality in the Atlantic region, including the regions in which the WEAs are located. The following summarizes that information and incorporates new and site-specific information.

Southeastern Coastal Waters and Water Quality

In the *National Coastal Condition Report IV* (EPA, 2012a), EPA rated the quality of the nation's coastal waters and sediments on a scale of poor, fair, and good using an index based on dissolved oxygen, chlorophyll a, nitrogen, phosphorus, and water clarity for water quality and an index of sediment toxicity, sediment contaminants, and total organic carbon for sediment quality. According to the *National Coastal Condition Report IV*, EPA rated portions of the Southeast that include much of the North Carolina and South Carolina coastlines as "fair" to "poor" for water quality (Figure 4-1) and "fair to poor" for sediment quality (Figure 4-2a).

North Carolina Coastal Waters

The North Carolina ports of Wilmington, Wanchese, and Morehead City are located along the coast, with a population density ranging from 125 to 900 people per square mile as of 2006 (see Figure 4-2b). Coastal waters include the Albemarle and Pamlico Sounds. The Albemarle Sound was characterized by low levels of chlorophyll a and dissolved oxygen and was also found to be susceptible to frequent nuisance/toxic blooms in 1999 (the last year of available data) (NOAA, 2013a). Pamlico Sound experiences occasional *Karenia brevis* blooms (the organism responsible for red tide) transported from Florida by the Gulf Stream. Pamlico Sound is experiencing rapid development in areas without the necessary sewage treatment expansion/upgrades, and this is expected to increase nutrient loads to coastal waterways (NOAA, 2013a). The North Carolina coastal shorelines, bays, and estuaries are listed as impaired (EPA, 2012a). In 2014, 321.2 square miles of coastal shoreline in North Carolina were listed as impaired for fish consumption due to mercury (EPA, 2014c). Coastal bays and estuaries are sampled separately from the coastal shoreline area in North Carolina; 100% of those coastal bays and estuaries are listed as impaired for fish consumption (3,324 square miles). Not all of the coastal and bay area has been assessed for impairment for aquatic life. However, 89.6% of the 799.7 square miles that have been assessed were identified as impaired for aquatic life. Causes of impairment to North Carolina bays and estuaries include algal growth (46.6 square miles), mercury (3,324.4 square miles), metals (697.2 square miles), organic enrichment/oxygen depletion (10.5 square miles), pathogens (323 square miles), metals other than mercury (29.3 square miles), acidity (17.9 square miles), and turbidity (9.8 square miles) (EPA, 2014c).

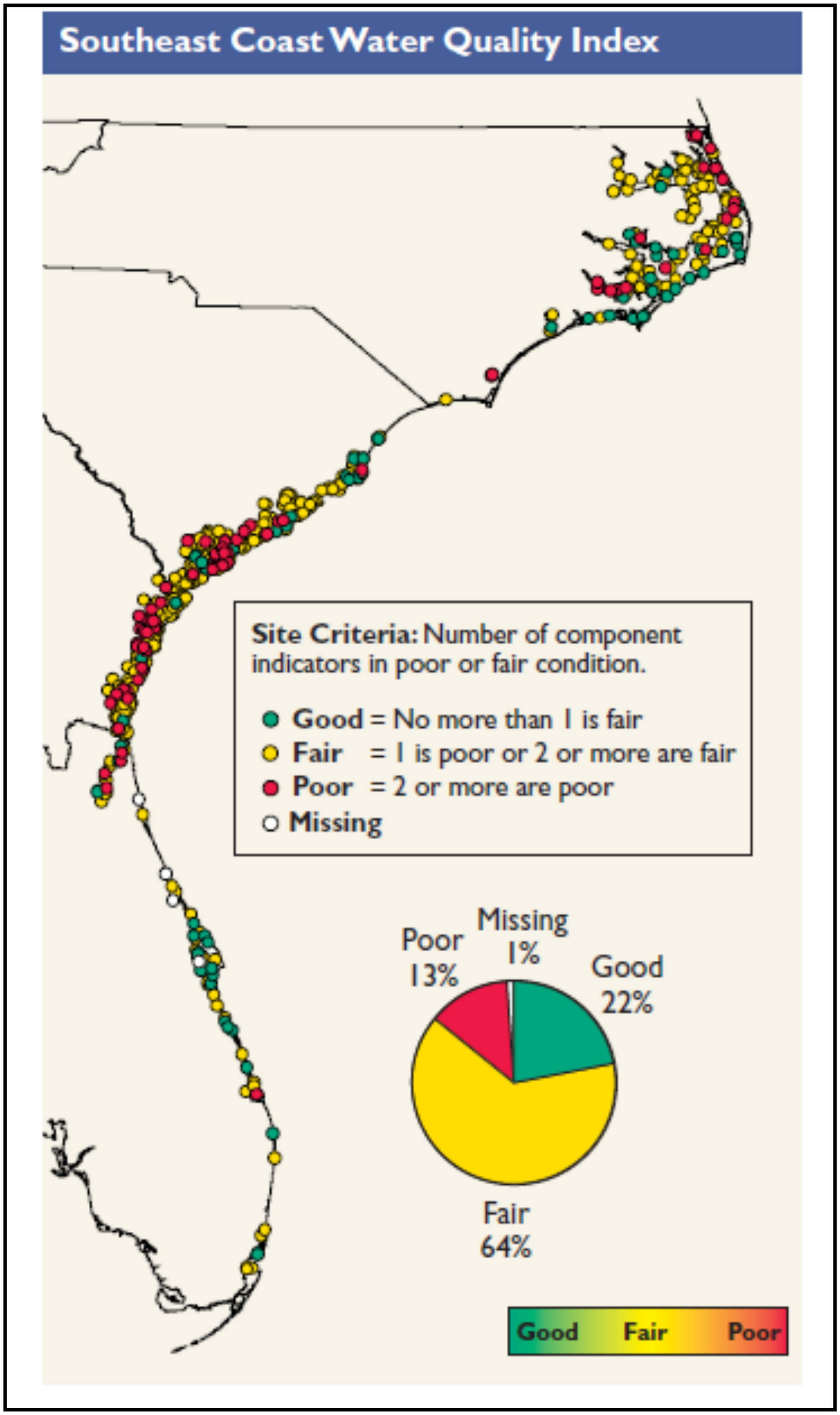


Figure 4-1 **Water Quality Index for the Southeast Coast**

(EPA, 2012a)

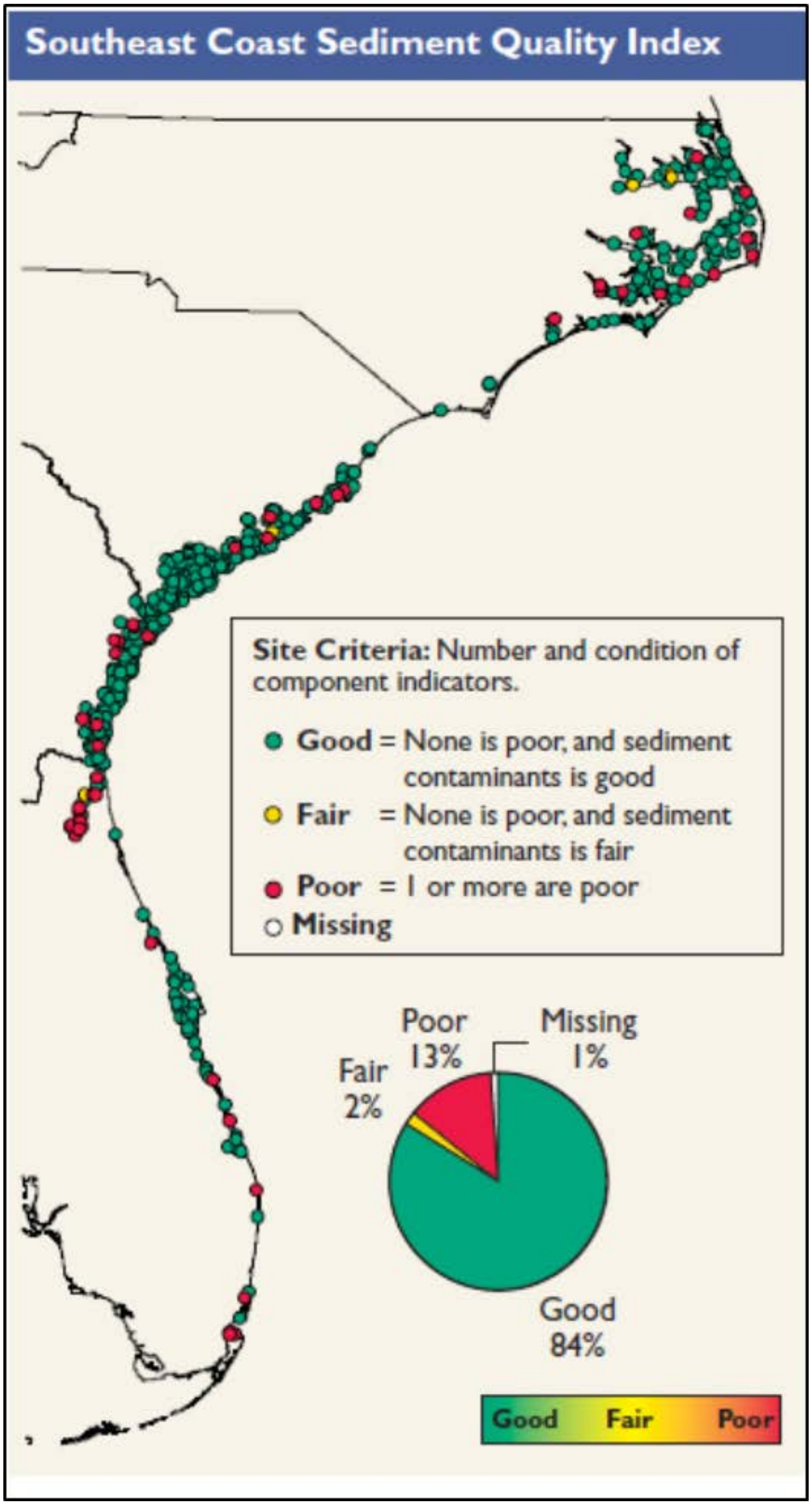


Figure 4-2a **Sediment Quality Index for the Southeast Coast**

(EPA, 2012a)

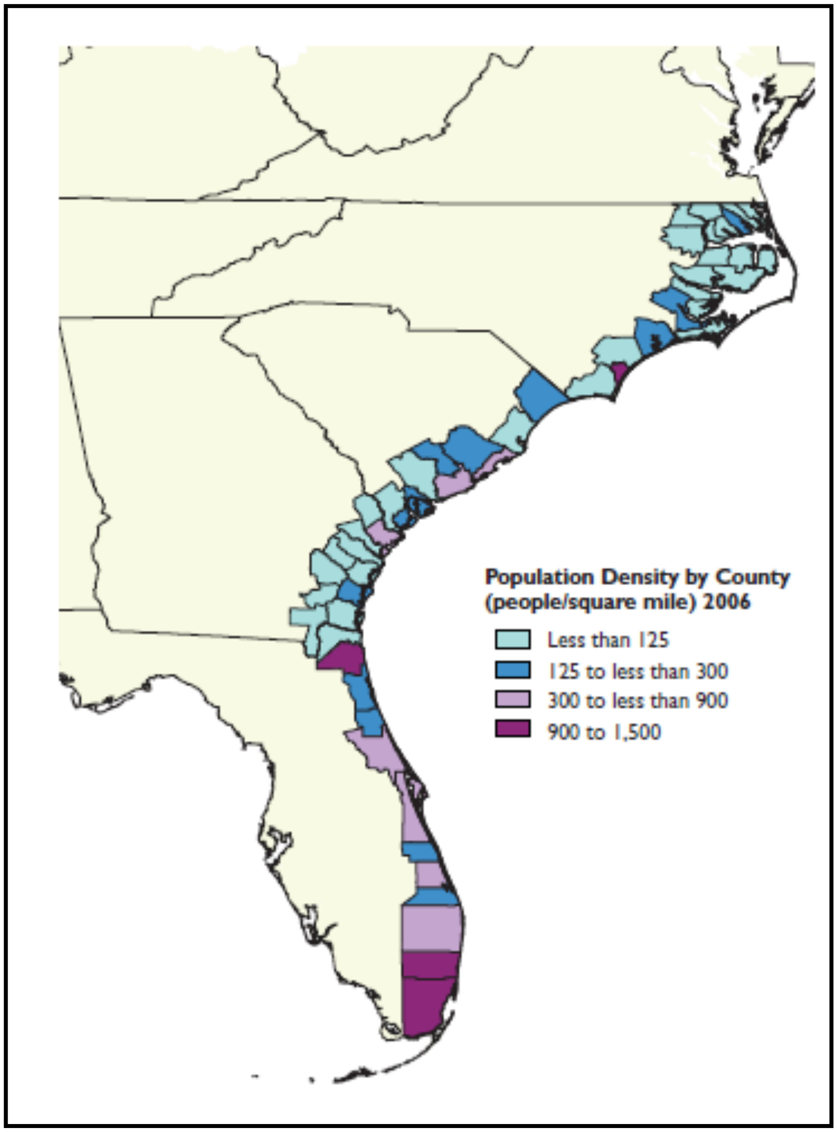


Figure 4-2b Population Density for the Southeast Coastline

(EPA, 2012a)

Marine Waters

No data specific to the water quality of each WEA are available at this time. The majority of pollutants to marine water quality originate onshore; these onshore sources include discharges from point sources such as wastewater treatment facilities, non-point sources such as stormwater runoff, and agricultural runoff. As the distance from shore increases, oceanic circulation and the volume of water would disperse, dilute, and biodegrade many contaminants that originate from shore (BOEM, 2012b). Sources of offshore pollutants would be potential discharges from ships. Ocean-going vessels sometimes discharge bilge and ballast water and sanitary waste prior to entering state waters due to state restrictions on discharges in their waters (MMS 2007a).

Impact Analysis of Alternative A

Impacts on water quality under Alternative A could result from the following:

- Drilling, coring, and bottom sampling may cause increased turbidity throughout the water column.
- Bilge and ballast water discharges may contain mixtures of petroleum products and metals.
- Sanitary/domestic wastewater discharges may contain pathogens, nutrients, and pollutants that may decrease local water quality.
- Accidental spills of fuels and maintenance materials from vessels and meteorological towers or buoys may introduce petroleum products and hazardous solvents into the water column.

Site Characterization (Surveys and G&G Activities)

The potential water quality impacts that could occur as a result of site characterization G&G activities were previously analyzed and found to be negligible in the G&G Final PEIS (BOEM, 2014a), which is incorporated here by reference.

Bilge and ballast water, which could contain petroleum products and metals from oily bilge residues, could be discharged in areas outside 13 nm from shore. However, within federal and state waters, discharge of oily water is prohibited. Survey vessels would likely have holding tanks for sanitary waste, and would not discharge untreated sanitary waste within federal or state waters.

Site Assessment Activities (Installation/Construction and Operation of Towers and Buoys)

Potential water quality effects from site assessment activities would be similar to those described above for site characterization activities.

Routine Activities

The routine activities associated with Alternative A that would affect coastal and marine water quality include vessel discharges (including bilge and ballast water and sanitary waste) and structure installation and removal. A general description of these impacts on coastal and marine water quality is presented in Section 5.2.4 of the G&G Final PEIS (BOEM, 2014a).

Construction, Decommissioning, and Operations

Meteorological and oceanographic data collection towers and buoys are described in Section 3.2.2. The installation of such equipment would disturb the seabed via anchoring, pile driving, and placement of scour protection devices. Because the equipment is compact, only small, local changes in water quality (such as increased turbidity) in the vicinity of the structures would occur. The small changes would most likely occur over approximately 30 to 40 square feet (3 to 4 square meters) in the vicinity of the equipment, assuming the area of influence is approximately 3 feet (1 meter) above the equipment, with a radius of about twice the height of the equipment. These small changes would cease to occur during operation of towers and buoys. Additional discussion on increased sediment concentration (as a proxy for turbidity) in the water column is found in Section 4.4.2.

Installation of meteorological towers and buoys would be covered by the USACE NWP 5. NWP 5 covers the placement of scientific measurement devices such as staff gauges, tide gauges, water recording devices, water quality testing and improvement devices, meteorological stations, and similar structures. A standard permit may be required from USACE if the meteorological tower installations do not meet the terms and conditions of the NWP or if USACE determines that the installation will result in more than minimal adverse effects on the aquatic environment.

Non-Routine Events

The water quality effects of non-routine events such as storms, allisions/collisions, and spills are described in Section 3.3. Storms would be the primary non-routine event that would affect the water quality of the proposed action area. Waves and currents associated with seasonal storm events, particularly hurricanes, have the potential to cause seabed mobility in the proposed action area that can result in erosion, transport, or re-suspension and deposition of sediments.

Impacts on water quality from accidental spills of oils, lubricants, and/or releases of solid debris or trash could occur during proposed action construction, installation, or decommissioning of meteorological towers or buoys. Most equipment on the meteorological towers and buoys would be powered by batteries charged by small wind turbines and solar panels. However, diesel generators may be used on some of the anticipated meteorological towers. Minor diesel fuel spills may also occur during refueling of generators. A diesel spill could occur as a result of allisions, collisions, accidents, or natural events. If a vessel collision occurs and if the collision leads to major hull damage, a diesel spill could occur. The amount of diesel fuel that could be released by a marine vessel involved in a collision would depend on the type of vessel and severity of the collision; typically, smaller spills may occur—the average spill volume between 2000 and 2009 was 88 gallons (Section 3.3.3). However, these small, localized impacts would be reduced significantly during operation of the towers and buoys because vessels would be needed only for periodic maintenance. These releases would cause minimal environmental consequences to water quality and would be spatially and temporally limited to the vicinity of the point of release (Bejarano et al., 2013).

Conclusion

The instrumentation used for site characterization is self-contained, so there would be no discharges to affect the water quality in the WEAs. Operational discharges in federal and state waters are strictly regulated. Although there would be operational discharges from vessels during site characterization surveys, oceanic circulation would disperse, dilute, and biodegrade vessel discharges, so impacts on water quality would be **minor**. The disturbance to the seabed during construction and installation, as well as decommissioning, of towers and buoys would cause small, localized impacts on the water quality in the vicinity of the structures. However, these small, localized impacts would cease during operation (and after removal activities) of the towers and buoys. Because collisions and allisions occur infrequently and rarely result in a spill, the risk of a spill would be small (BOEM, 2011c). In the unlikely event of a fuel spill, minimal impacts would result, because the spill would very likely be small and the fuel spillage would biodegrade within a short time. As a result, the potential impacts on water quality are not expected to be significant. Therefore, impacts on harbors, ports, coastal areas, and WEAs from vessel discharges, seabed disturbance, and potential spills associated with Alternative A would be **minor**.

4.4.2 Biological Resources

4.4.2.1 Birds

Description of the Affected Environment

The G&G Final PEIS (BOEM, 2014a) described the affected environment for three distinct taxonomic and ecological groups that could be affected by the proposed action: seabirds, waterfowl, and shorebirds. Marine and coastal bird species within each group are identified in the G&G Final PEIS (BOEM, 2014a), including threatened and endangered bird species. The G&G Final PEIS (BOEM, 2014a) also identified migratory bird flyways, bird conservation regions, birds of conservation concern, and important bird areas (IBA), which are hereby incorporated by reference into this EA. The impacts analyzed in the G&G Final PEIS (BOEM, 2014a) include acoustic sound sources, vessel and equipment noise, vessel traffic, trash and debris release, and accidental fuel spills. These same impacts will not be further addressed in this EA. Activities associated with the proposed action analyzed herein that may affect birds, including federally listed birds, include noise from pile driving construction, loss of habitat (water column habitat and benthic habitat), and prey abundance and distribution effects during meteorological tower and/or buoy construction, operation, and decommissioning.

In the offshore environment, bird abundance generally declines as distance from shore increases (Petersen et al., 2006; Paton et al., 2010). A study offshore New Jersey showed bird densities dropping precipitously a few miles from shore (NJDEP, 2010a). In addition, the number of bird species also declines with distance from shore. For example, of the 160 bird species that use the Atlantic flyway, 55 species use offshore (5 to 20 kilometers [km] from shore) and pelagic environments, and the remaining 105 species use bays, coastlines, and near-shore environments (Watts, 2010). In addition to the water birds that regularly use the Atlantic flyway, many land bird species also use the OCS, including several passerine species that pass through the region during spring and fall migration (Robinson Willmott et al., 2013; Normandeau, 2014). Compared to other areas in the Atlantic OCS, relatively low numbers of near-shore, pelagic, and gull species are predicted to occur within the Kitty Hawk WEA (Figures 4-3a through 4-3c). The predicted relative density of near-shore birds (Black Scoter, Common Eider, Common Loon, Common Tern, Double-crested Cormorant, Long-tailed Duck, Razorbill, Roseate Tern, Red-throated Loon, Surf Scoter, and White-winged Scoter) ranges from 0.101 to 1.6 individuals per transect area (Figure 4-3a). For offshore bird species (Cory’s Shearwater, Dovekie, Greater Shearwater, Northern Fulmar, Pomarine Jaeger, Red Phalarope, Sooty Shearwater, and Wilson’s Storm Petrel), the predicted relative density ranged from 0.0631 to 0.1 (Figure 4-3b). Lastly, for gull-like birds (Black-legged Kittiwake, Bonaparte’s Gull, Great Black-backed Gull, Herring

Gull, Laughing Gull, Northern Gannet, and Ring-billed Gull), the predicted relative density ranges from 0.161 to 0.25 individuals per transect.

As for the remaining WEAs (Wilmington East and West), the "Compendium of Avian Occurrence Information" (O'Connell et al., 2009) was used to produce a list of bird species found within the Wilmington East and West WEAs (Table 4-2). Of course, many other species of birds pass through the region during the fall and spring migration to and from South America and the Caribbean. It is possible that some of these birds may pass through the North Carolina WEAs. A recent acoustic study identified 61 species over the Frying Pan Shoals Light House located near the Wilmington East WEA (Figure 3-2; see Normandeau, 2014 Appendix 3 for the species list).

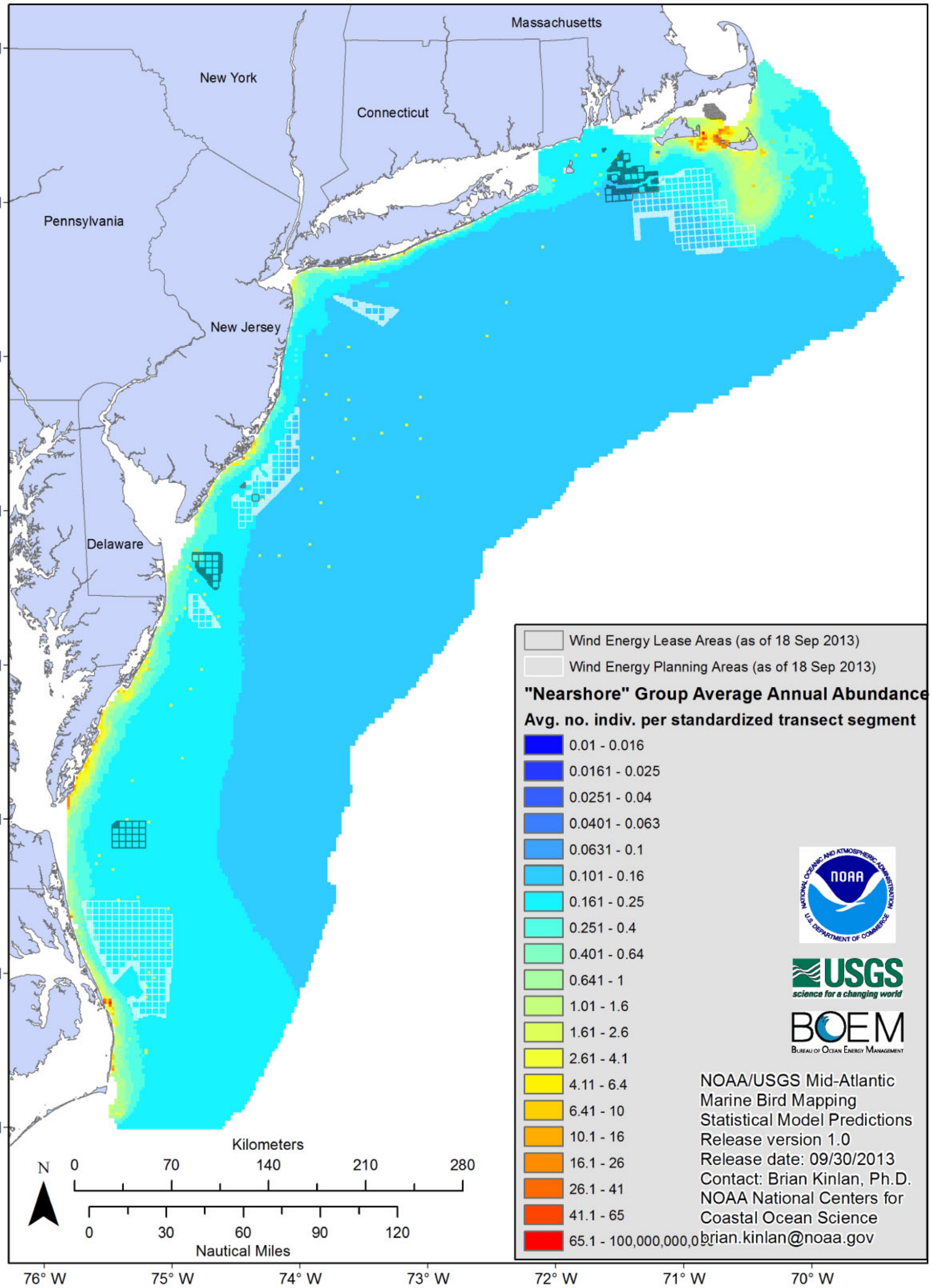


Figure 4-3a Predicted Average Annual Distribution of Near-shore Bird Species

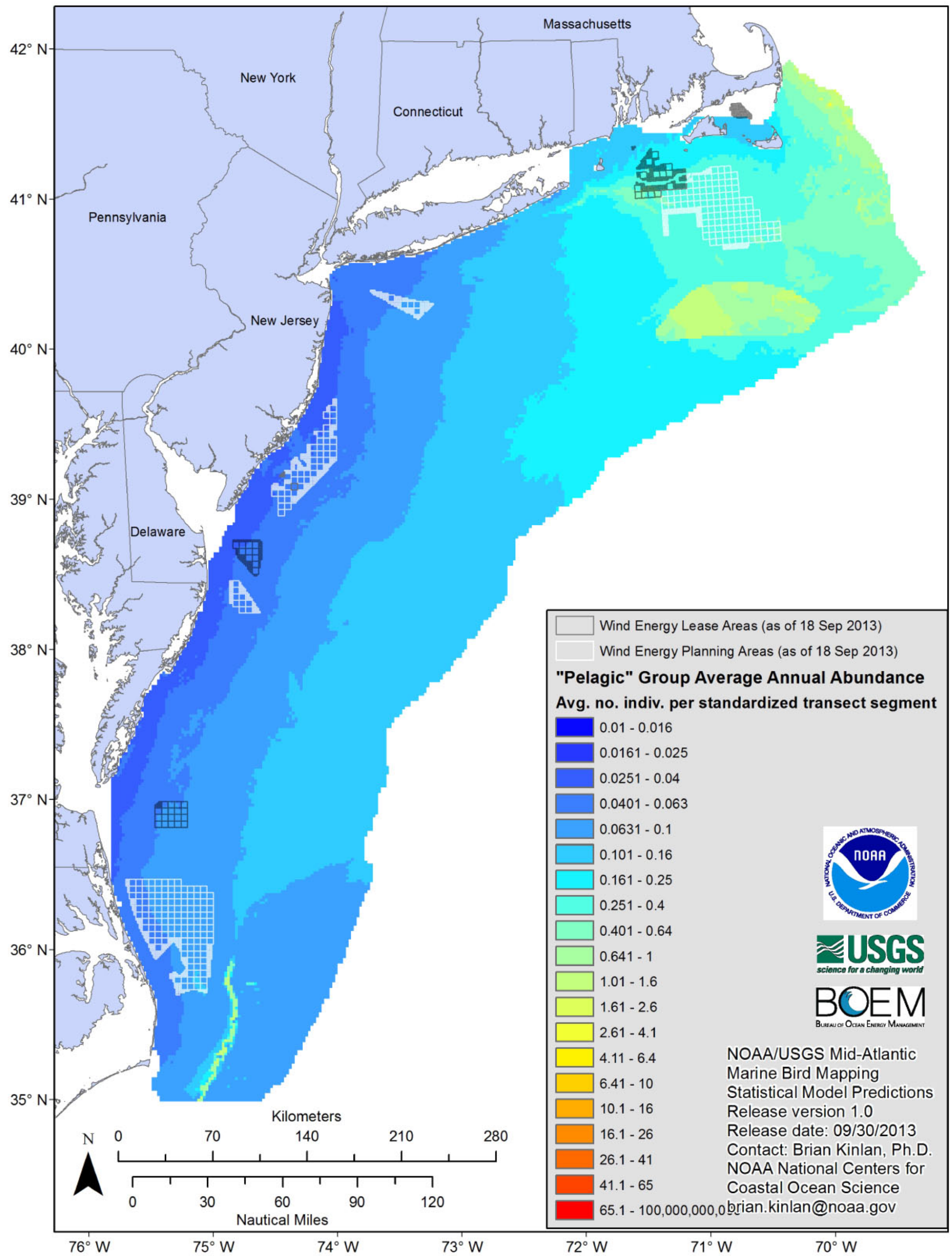


Figure 4-3b Predicted Average Annual Distribution of Pelagic Bird Species

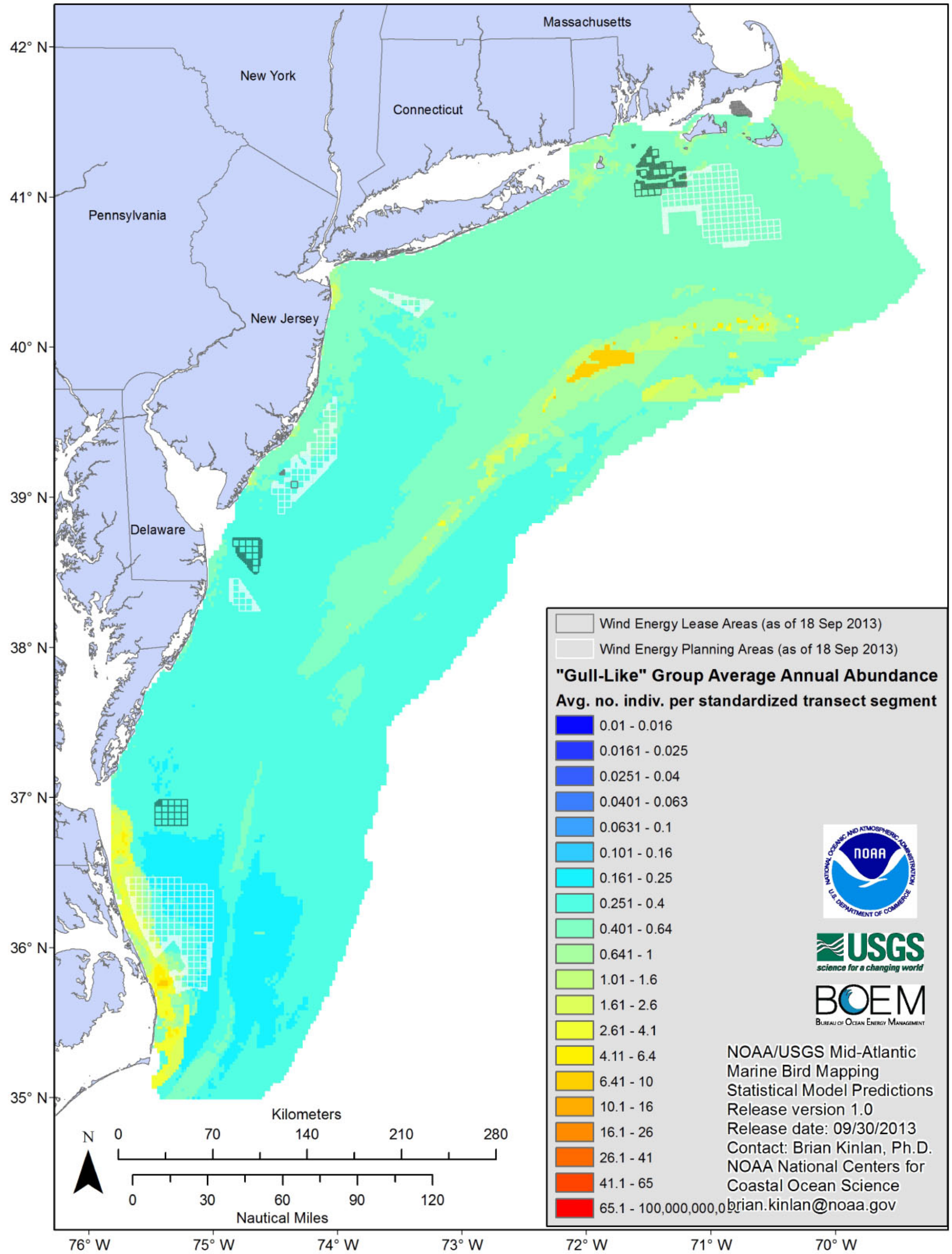


Figure 4-3c Predicted Average Annual Distribution of Gulls and Gannets

Table 4-2
Bird Species Known to Be Present within Wilmington East and West WEAs

Species	East	West
Audubon's Shearwater	X	X
Barn Swallow	X	
Black-legged Kittiwake		X
Black Tern	X	
Common Loon		X
Cory's Shearwater	X	X
Common Tern	X	
Forster's Tern		X
Greater Shearwater	X	
Herring Gull	X	
Laughing Gull	X	
Northern Gannet	X	X
Royal Tern	X	X
Red-Throated Loon	X	X
Source: O'Connell et al., 2009.		

Migratory Birds

Despite the level of human development and activity present, the mid-Atlantic coast plays an important role in the ecology of many bird species. The Atlantic Flyway, which encompasses all of the areas that could be affected by Alternative A (including the WEAs), is a major route for migratory birds, which are protected under the Migratory Bird Treaty Act of 1918 (MBTA). Chapter 4.2.9.3 of the G&G Final PEIS (BOEM, 2014a) discusses the use of Atlantic Coast habitats by migratory birds.

The official list of migratory birds that are protected under the MBTA, as well as the international treaties that the MBTA implements, is found at 50 CFR 10.13. The MBTA makes it illegal to "take" migratory birds, their eggs, feathers, or nests. Under Section 3 of Executive Order 13186, BOEM and USFWS established a Memorandum of Understanding (MOU) on June 4, 2009, which identifies specific areas where cooperation between the agencies would substantially contribute to the conservation and management of migratory birds and their habitats (BOEM, 2009). The purpose of the MOU is to strengthen migratory bird conservation through enhanced collaboration between the agencies (MOU, Section A). One of the underlying tenets identified in the MOU is to evaluate potential impacts on migratory birds and design or implement measures to avoid, minimize, or mitigate such impacts as appropriate (MOU, Sections C, D, E(1), F(1-3, 5), G(6)).

Bald Eagles and Golden Eagles

The Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. § 668–668d), prohibits the "take" and trade of bald and golden eagles. However, golden eagles are not expected to occur within or adjacent to the project area because golden eagles do not nest in Virginia. They migrate mostly along Appalachian ridgelines located far from the project area. As such, the project would have no effect on golden eagles. Bald eagles occur near wetlands such as seacoasts, rivers, large lakes, or marshes but not in the open ocean. Therefore, the marine portion of the project would have no effect on bald eagles.

Impact Analysis of Alternative A

The potential impacts on bird species that could occur as a result of the geophysical and geotechnical survey activities associated with the proposed action were previously analyzed in the G&G Final PEIS (BOEM, 2014a), the G&G Final PEIS's Programmatic Biological Assessment (G&G PBA) (BOEM, 2012c), USFWS's concurrence letter for the G&G PBA, BOEM's BA for the proposed action in this EA (*Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina, South Carolina, and Georgia Biological Assessment* [2014b]), and USFWS's concurrence letter for the BA and are hereby incorporated by reference. In summary, these documents' analyses of impacts on birds concluded that:

- Impacts from active acoustic sound sources used in renewable energy surveys are expected to be negligible.
- Impacts from vessel and equipment noise are expected to be negligible.
- Impacts from vessel traffic are expected to be negligible.
- Impacts from trash or debris releases are expected to be negligible.
- Impacts from accidental fuel spills are expected to be negligible.
- Impacts on federally listed birds from all activities proposed in the G&G Final PEIS (BOEM, 2014a) were addressed in the G&G PBA (BOEM, 2012c), where USFWS concurred with BOEM's determination that all proposed G&G activities would have no effect or would not likely adversely affect federally listed bird species, depending on the bird species. In addition, BOEM consulted USFWS in 2014 to include additional bird species and the buoy and meteorological tower activities that are covered in this EA; USFWS concurred with BOEM's determination of *no effect* or *not likely to adversely affect* federally listed bird species, depending on the bird species (see Table 4-3, below). Therefore, between USFWS's G&G PBA concurrence letter for G&G activities and the BA concurrence letter for this EA's proposed action for federally listed bird species, BOEM has fulfilled its obligation under Section 7(a)(2) of the ESA, and no federally listed bird species will be jeopardized.
- Bird species covered in the USFWS concurrence letter for the BA (BOEM, 2014b) are listed in Table 4-3, below.

It should be noted that while the assessment of impacts on birds from acoustic sound sources, vessel and equipment noise, vessel traffic, trash and debris, and accidental fuel spills in the G&G Final PEIS (BOEM, 2014a) was for G&G-related activities only, similar impacts are anticipated for the proposed action covered in this EA. There would be a different number of vessel trips for activities covered in this EA, but the overall types of impacts on birds as discussed in the G&G PBA (BOEM, 2012c), for which USFWS issued concurrence, would be similar; therefore, the impact levels and conclusions would be anticipated to be the same. Potential impacts on birds covered by the G&G Final PEIS (BOEM, 2014a) will not be further addressed and the following analysis focuses only on new and different potential impacts on birds that could result under the proposed action or alternatives in this EA.

Table 4-3
Federally Listed Bird Species included in USFWS Consultation

Species	Scientific Name	Federal Listing Status	Critical Habitat
Bermuda Petrel	*Pterodroma cahow*	Endangered	N/A
Black-Capped Petrel	*Pterodroma hasitata*	Candidate	-
Kirtland's Warbler	*Setophaga kirtlandii*	Endangered	N/A
Piping Plover	*Charadrius melodus*	Threatened	18 coastal units
Roseate Tern	*Sterna dougallii*	Endangered	N/A
Red Knot	*Calidris canutus*	Threatened	N/A

Activities in this EA that have not already been covered in the G&G Final PEIS (BOEM, 2014a) that could affect bird species include impacts associated with meteorological towers and buoys, such as piling driving noise, collisions, lighting, and decommissioning.

Meteorological Towers

The construction of meteorological towers would result in increased airborne noise, primarily from pile driving activities. As with any sound in the atmospheric environment, the type and intensity of the sound and the distance it travels are dependent on multiple factors and can vary greatly. These factors include atmospheric conditions, the type and size of the pile, the type of substrate, the depth of the water, and the type and size of the impact hammer (Madsen et al., 2006). Bird species that are foraging and migrating through an area where a meteorological tower is being constructed could be exposed to pile driving noise that would occur from May to October (pile driving restrictions are in place for North Atlantic right whale migration during the other months of the year). The reactions of these species (if present in the area) during pile driving activities could range from mild annoyance to escape behavior. However, the potential noise impacts would be short term, lasting only for the duration of the pile driving activity (4 to 8 hours per day over 3 days for each tower). In addition, bird species are highly mobile and would be able to avoid the construction area; the noise from pile driving is not anticipated to affect the migratory movement or migratory behavior of these species through the area. Therefore, pile driving related construction noise may affect these bird species for a short period of time, but the effect would be **minor**. Tower decommissioning could also generate noise, but no pile driving would be required during tower removal; therefore, noise levels during decommissioning would be **negligible**.

Bird collisions with communication towers are well documented (Longcore et al., 2012), and the presence of a meteorological tower in open water areas could result in bird (i.e., gulls, terns, shorebirds, petrels, shearwaters sea ducks, alcids, and passerines) collisions, leading to injury or death. Under poor visibility conditions (fog and rain), migrating birds become disoriented and circle lighted communication towers instead of continuing on their migratory paths, greatly increasing their risk of collision (Huppop et al., 2006). All meteorological towers would have aviation obstruction lights. Red flashing aviation obstruction lights are commonly used at land-based wind facilities without any observed increase in avian mortality compared with unlit turbine towers (Kerlinger et al., 2010). Therefore, red flashing lights (i.e., L-864 medium intensity aeronautical obstruction lights that emit infrared energy within 675 to 900 nanometers at a flash rate of 20 flashes per minute) would be used at the meteorological towers to reduce the risk of bird collisions. Under good weather conditions, most migratory bird species in the vicinity of the proposed lease areas would be flying at altitudes higher than the anticipated meteorological towers. However, some individuals may fly lower (e.g., sea ducks, cormorants, loons, shearwaters, petrels, alcids, gannets) and could encounter towers. It is anticipated that the meteorological towers contemplated in this EA would be self-supported structures and not require guy wires for support and stability. Unlike the meteorological towers themselves, guy wires are invisible to birds and may not be seen until it is too late to avoid them. Although perching on meteorological facilities would not pose an adverse effect, terns may also perch on tower equipment including handrails and equipment sheds. Lattice-type masts with numerous diagonal and horizontal bars are more likely to provide perching opportunities than meteorological towers with monopole masts.

Because of the small number of anticipated towers scattered over a large area (one tower for each WEA, for a total of three towers covering 307,590 acres) at distances greater than 11 miles (10 nm) from the shoreline, the chances of birds colliding with a meteorological tower would be rare, resulting in **minor** impacts on marine and coastal bird populations. In addition, the towers would be temporary and would be removed either after the site assessment activities are concluded or at the end of the lease.

Standard Operating Conditions for Birds

The following SOCs are intended to ensure that the potential for adverse impacts on birds is minimized, if not eliminated. These SOCs are considered part of the proposed action.

1. The lessee will use only red flashing strobe-like lights for aviation obstruction lights for meteorological towers. In addition these lights must emit infrared energy within 675–900 nanometers so that they are compatible with DOD night vision goggle equipment.
2. Navigation lights for meteorological towers and buoys must be in compliance with USCG requirements for private aids to navigation (https://www.uscg.mil/forms/cg/CG_2554.pdf).

3. For lighting on the meteorological towers, buoys, and support vessels not described in (1) or (2) above, the lessee must use lighting only when necessary, and that lighting must be hooded downward and directed when possible to reduce upward illumination and the illumination of adjacent waters.
4. By January 31 of each year, the lessee must submit an annual report to BOEM documenting any dead birds or bats found on vessels and structures during installation, operation, and decommissioning of a meteorological tower or buoy. The annual report must contain the following information: the name of species, date found, location, a picture to confirm species identity (if possible), and any other relevant information. It is also anticipated that any carcasses with Federal or research bands will be reported to the USGS Bird Band Laboratory (https://www.pwrc.usgs.gov/bbl/).

Conclusion

The construction, presence, and decommissioning of meteorological towers and buoys pose no threat of significant impact on birds. Potential noise impacts from tower construction and decommissioning could have short-term, minor impacts on birds that may be in the area during these activities. The risk of collision would be minor because of the small number of meteorological towers and buoys proposed, their size, and their distance from shore and each other. For federally listed bird species, USFWS has concurred with BOEM's *no effect* and *not likely to adversely affect* determinations for all activities that would occur under the proposed action. Additionally, SOCs described above would further reduce the minimal potential for the proposed action to affect birds. Therefore, effects on birds would be **negligible** to **minor**.

4.4.2.2 Bats

Description of the Affected Environment

The bat species that currently occur, or historically occurred, along North Carolina coastal counties are detailed in Table 4-4. All of these species inhabit trees or manmade structures during all or part of the year, and four of the bats—Rafinesque's big-eared bat, northern yellow bat, Seminole bat, and southeastern myotis—are found near or over water (North Carolina Natural Heritage Program, 2013), while others in Table 4-4 may be found in coastal counties.

Table 4-4
Bats Along Coastal Counties of North Carolina

Common Name	Scientific Name
Rafinesque's Big-eared Bat*	*Corynorhinus rafinesquii macrotis*
Hoary Bat	*Lasiurus cinereus*
Northern Yellow Bat	*Lasiurus intermedius*
Seminole Bat	*Lasiurus seminolus*
Southeastern Myotis	*Myotis austroriparius*
Northern Long-eared bat **	*Myotis septentrionalis*
Eastern Red Bat	*Lasiurus borealis*
Big Brown Bat	*Eptesicus fuscus*
Silver Haired Bat	*Lasionycteris noctivagans*
Evening Bat	*Nycticeius humeralis*
Tri-colored Bat	*Perimyotis subflavus*
Mexican Free-tailed bat	*Tadarida brasiliensis*
*Coastal plain subspecies ** Federally listed as threatened Sources: North Carolina Natural Heritage Program, 2014; BCI, 2015).	

Although the migration patterns of bats are not well documented, many bats species make extensive use of linear features in the landscape, such as ridges of rivers, while commuting and migrating, suggesting a preference for overland migration routes. It is also known that bats fly along the coast, and bat migration over the open ocean has been documented. For example, the hoary bat on southeast Farallon Island, approximately 48 km west of San Francisco, migrates to the mainland in fall (Cryan and Brown, 2007), eastern red bats were photographed during the day near the Virginia WEA flying at an altitude greater than 100 meters (Hatch et al., 2013), and several bat species in Europe cross the Baltic Sea in migration between southern Sweden and Denmark (Ahlén et al., 2009). However, information with regard to bat species found offshore North Carolina is limited. Most information on offshore bat activity in the mid-Atlantic comes from the New Jersey Ecological Baseline Study, which includes survey results for bats over the New Jersey WEA offshore New Jersey out to 20 nm (NJDEP, 2010a, Vol. I, Appendix B). Shipboard surveys were conducted in 2009 from March to June and August to October. No bats were detected during the March, April, or June surveys; one was detected in May. Over eight nights, from August to October, 53 bats were detected. Of the 53 recordings, the eastern red bat was the most commonly detected bat, during the fall offshore along the Delmarva Peninsula, while only a few hoary bats and big brown/silver-haired bats were detected during the spring and fall. The mean distance from shore where bats were detected was 5.2 nm, with the farthest distance being 10.4 nm (NJDEP, 2010a, Vol. I, Appendix B). The conclusions of the New Jersey Ecological Baseline Study suggest that it is unlikely that bats will be present in the Kitty Hawk and Wilmington East WEAs, which are 24 nm and 15 nm from shore, respectively. However, it is possible that some bats may be present in the Wilmington West WEA, which is 10 nm from shore, a distance just within the 10.4-nm range within which the New Jersey Ecological Baseline Study documented some bats.

Impact Analysis of Alternative A

Bats could possibly migrate or forage through the WEAs. While their presence in the WEAs would be rare, potential impacts on bats could include avoidance or attraction responses to the structures due to noise, lighting, and the possible presence of insects.

Routine Activities

Site Assessment Activities

Bats are not expected to be present in the WEAs; therefore, impacts on bats are not expected during meteorological tower or buoy construction, operation, or decommissioning within the WEAs, especially in the Kitty Hawk and Wilmington East WEAs. There are North Atlantic right whale seasonal restrictions on pile driving from November through April, meaning that the three meteorological towers could be constructed during the spring, when there is the potential for bats to be present in the Wilmington West WEA based on historic observations. From May through October, potential construction noise impacts on bats would be short-term and temporary during the 8-day to 10-week construction periods of the three meteorological towers. It would take 1 to 2 days to install each of the meteorological buoys anticipated in the WEAs. Noise effects could induce avoidance or attraction responses to structures, but such effects would be difficult to distinguish from similar effects from lighting or the visual presence of the structures. Unlike large-scale wind turbines used at commercial wind facilities, the small wind turbines (with blades less than 2 meters long) that may be used for charging batteries on the anticipated meteorological towers and buoys are not expected to affect bats, if bats are present over 7 miles from shore.

Because of the anticipated distance between the meteorological towers and buoys and the limited occurrence of bats in the WEAs, there would be no additive effect on bats from construction of all the meteorological towers or placement of buoys. In addition to collecting meteorological and oceanographic data, these meteorological towers and buoys would provide platforms that would assist in conducting biological studies, including monitoring for the presence of bats.

Site Characterization Activities

If bats are present during site characterization activities, impacts would be limited to avoidance or attraction responses to the vessels conducting surveys. Bats may also be present because vessels, which may trigger attraction or avoidance responses, are traversing harbor or coastal areas on their way to or from the WEAs. These potential avoidance and attraction responses, however, would not be anticipated to have any adverse effect on the bats.

Non-Routine Events

It is rare but possible that migrating bats may be driven to offshore OCS waters by a storm and subsequently into a tower. However, the land-based roosting, breeding, and foraging behavior of bats, as well as their limited home ranges and echolocation sensory systems, suggest that there is small risk of a bat being blown that far out of their habitat range. In the unlikely event that a bat so blown off course would return from the open oceans in the vicinity of the tower or buoys in one of the WEAs, the chances of the bat striking the tower or buoy are very small and would therefore be negligible.

Conclusion

While it would be rare that bat species would forage or migrate through the WEAs, these mammals may, on occasion, be driven to the project area by prevailing winds and weather. In the event bats are present, impacts would be limited to avoidance or attraction responses. Because of the anticipated distance between the meteorological towers and buoys, there would be no additive effect on bats from construction of all the anticipated meteorological towers or placement of buoys. In fact, the anticipated data collection activities (e.g., biological surveys) may assist in future environmental analyses of impacts on bats from OCS activities. To the extent that there would be any impacts on individuals, the overall impact on bats would be **negligible**. The SOCs for birds in Section 4.4.2.1, including lighting restrictions and prohibition on guy wires, may also reduce or eliminate any potential impacts on bats.

4.4.2.3 Benthic Resources

Description of the Affected Environment

The G&G Final PEIS (BOEM, 2014a) includes a description of the affected environment for benthic communities and is hereby incorporated by reference into this EA. The G&G Final PEIS (BOEM, 2014a) describes the affected environment for the Mid-Atlantic Bight (MAB) ecoregion, which extends from Cape Cod, Massachusetts, to Cape Hatteras, NC; the South-Atlantic Bight (SAB), which extends from Cape Hatteras, NC, to Cape Canaveral, Florida; and the Hatteras middle slope, which represents a transition between the MAB and SAB. Sensitive benthic habitats that occur in the MAB, SAB, and Hatteras middle slope that have the potential to be affected by G&G activities are also identified in the G&G Final PEIS (BOEM, 2014a). These include live bottom areas, deep-water corals and chemosynthetic communities, and artificial reefs.

In other areas where the presence of deep-water corals is known but the distribution of coral sites is not well documented, broad areas have been designated as Habitat Areas of Particular Concern (HAPCs) by the South Atlantic Fishery Management Council to protect these communities from physical damage by fishing gear. Although the South Atlantic Fishery Management Council does not regulate activities unrelated to fishing, the designation highlights the ecological importance of these areas and their sensitivity to seafloor-disturbing activities. A preliminary analysis of hard-bottom areas within the WEAs (Figures 4-4, 4-5, and 4-6) shows that most of the WEAs are covered in soft sediment. In addition to this preliminary analysis, a recent geophysical survey conducted as part of a BOEM-funded seafloor mapping study identified some potential hard-bottom habitats in the Wilmington East WEA (BOEM, 2015d) that will need to be further investigated or avoided by the lessee.

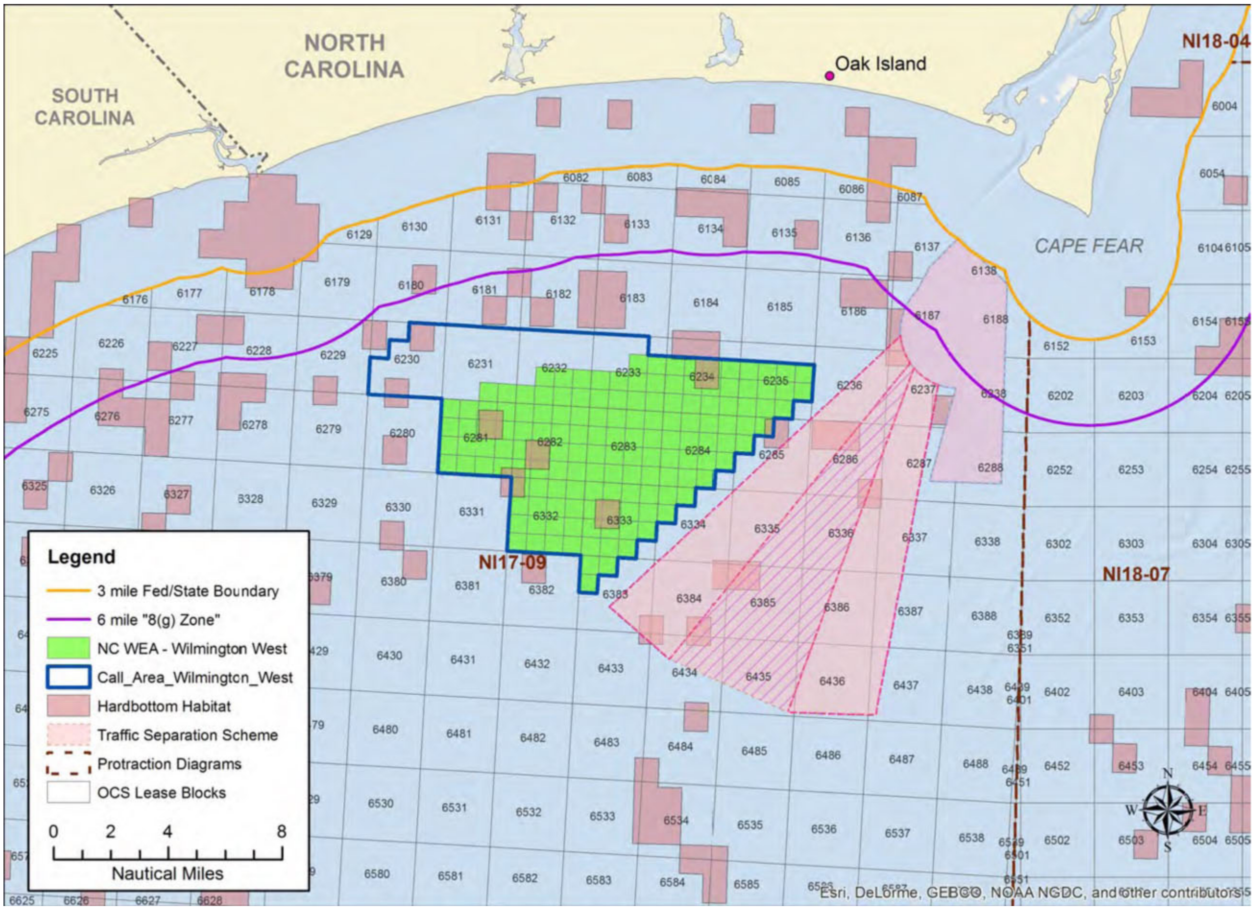


Figure 4-4 Wilmington West Hard-bottom Habitat

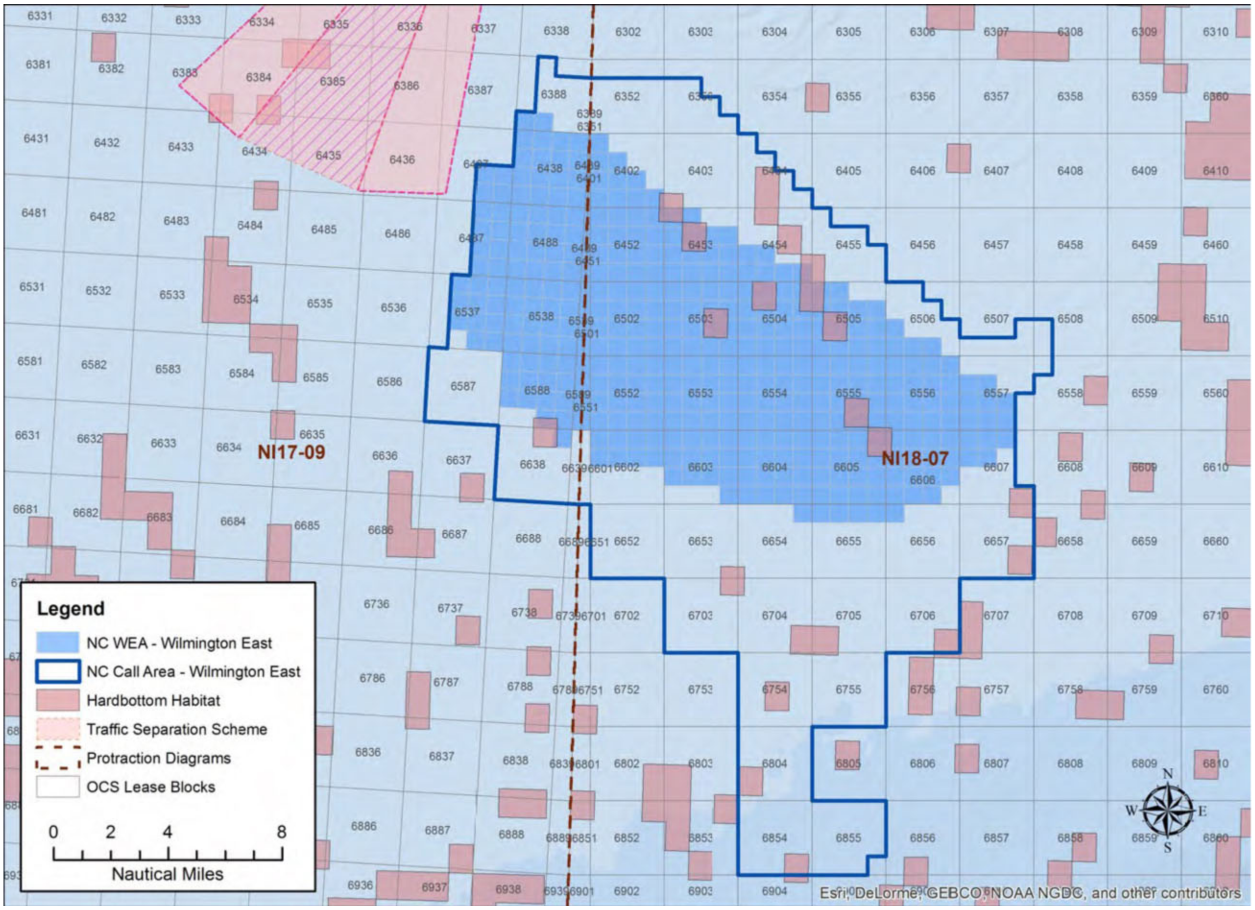


Figure 4-5 **Wilmington East Hard-bottom Habitat**

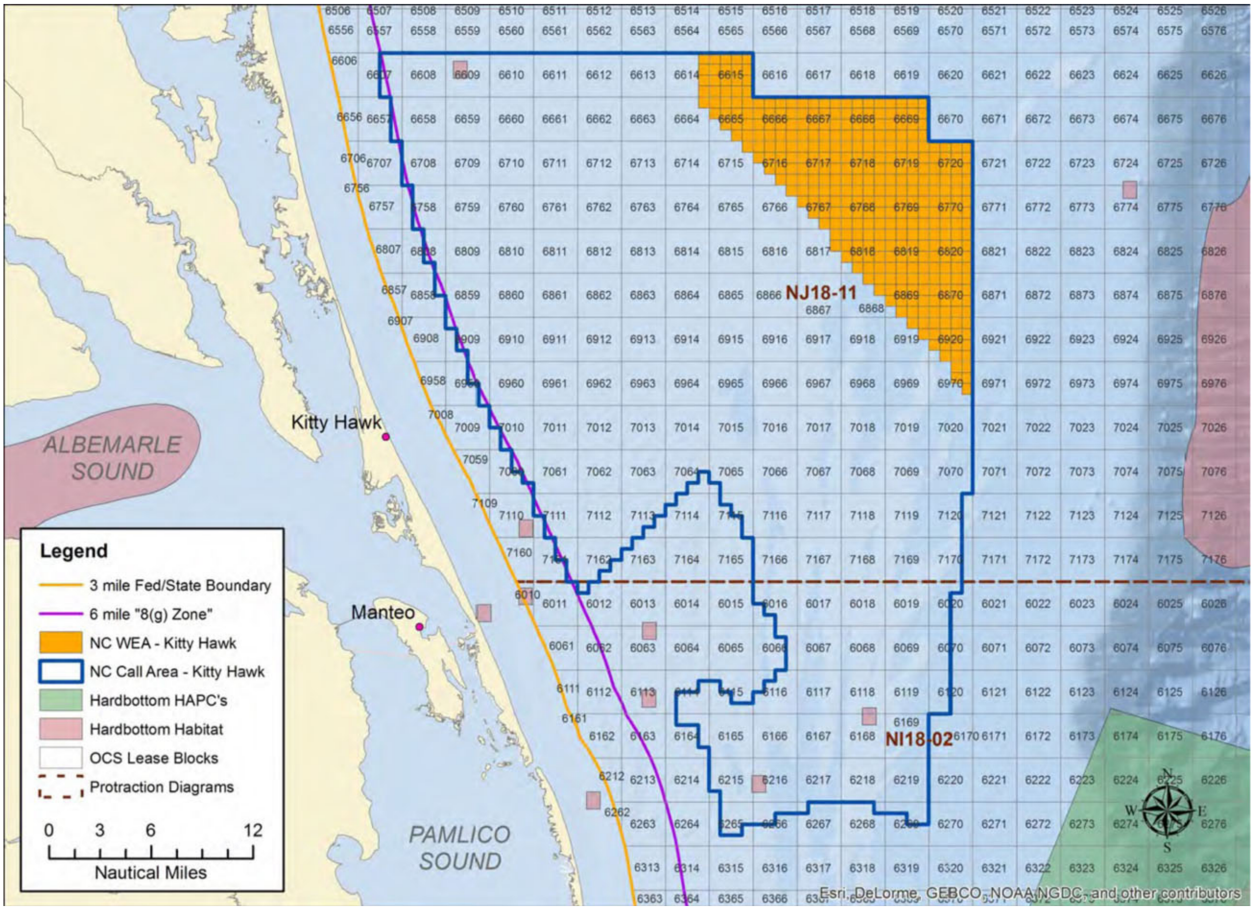


Figure 4-6 Kitty Hawk Hard-bottom Habitat

Impact Analysis of Alternative A

The potential impacts on benthic communities that could occur as a result of the G&G survey activities associated with the proposed action were previously analyzed in the G&G Final PEIS (BOEM, 2014a) and are hereby incorporated by reference. In summary, the G&G Final PEIS (BOEM, 2014a) analysis of impacts on benthic communities from G&G activities associated with renewable energy surveys concluded that:

- Impacts from active acoustic sound sources are expected to be negligible.
- Impacts from trash and debris are expected to be negligible.
- Impacts from seafloor disturbance are expected to be negligible.
- Impacts of accidental fuel spills are expected to be negligible.

Although the assessment of impacts on benthic communities from acoustic sound sources, trash and debris release, seafloor disturbance, and accidental fuel spills in the G&G Final PEIS (BOEM, 2014a) was for G&G-related activities only, similar impacts would potentially occur for the proposed action covered in this EA. There will be a different number of vessel trips and areas of seafloor disturbance for activities covered in this EA (as described in Sections 3.2.1 and 3.2.2), but the overall impact types on benthic communities are similar and the impact level and conclusions are anticipated to be the same. Therefore, these potential benthic community impacts will not be further addressed and the analysis below will focus on other potential benthic community impacts that could result under the proposed action of this EA.

Activities in this EA not covered in the G&G Final PEIS (BOEM, 2014a) that could affect benthic resources include impacts associated with meteorological towers and buoys, specifically seafloor disturbance and smoothing, or loss of benthic resources from the towers and buoys related to pile driving and anchor placement, structure footprints, and associated scour control systems.

Routine Activities

It is anticipated that bottom disturbance associated with the installation of meteorological towers and buoys could potentially affect the seafloor within a maximum radius of 1,500 feet (~450 meters) or 162 acres around each bottom-founded structure including all anchorages and appurtenances of the support vessels. These anchorages would be temporary and would not affect the seafloor of the entire 1,500-foot radius.

A scour control system may be used around the base of the structure, which would be composed of installed rock armor or artificial seaweed mattresses affixed to the seafloor by anchoring pins. In some areas that are not expected to be subject to scour, or where expected scouring would not compromise the integrity of the structure, scour protection may not be required. If, however, scouring does occur at a given location, the area affected can be expected to be similar to or slightly larger than the projected area covered by a scour control system. For purposes of comparison, rock armor scour protection for a wind turbine foundation would cover an area of approximately 0.37 acre (as discussed in Section 3.2.2.3); the area of scour protection for a meteorological tower would be smaller. An additional 0.05 acre of disturbance would occur at each tower assuming each of the three towers requires a scour control system and they all use a steel jacket foundation (which is the largest type of foundation, totaling 2,000 square feet). Total disturbance would be less than 0.2% of the total area of all WEAs. Upon decommissioning and removal, the equivalent area would be disturbed by severing the pile foundation legs at least 15 feet (4.5 meters) below the mudline (30 CFR 585.910). Removing the scour control system would disturb the same area as installation and would introduce a proximate cloud of turbidity over the seafloor. Re-suspended sediment would temporarily interfere with filter feeding organisms until the sediment has resettled. The duration of sediment suspension would depend upon ocean currents and sediment grain size but is anticipated to be short (BOEM, 2012b).

The recovery of soft-bottom communities in number of individuals to predisturbance levels may take 1 to 3 years, depending on the actual species density and diversity in the immediate area at the time of disturbance (BOEM, 2012b). Recovery of community composition or trophic structure that exploits all ecologic niches available may take longer (Continental Shelf Associates, Inc., 2004). The duration of activities directly affecting benthic communities during site characterization surveys, meteorological tower and buoy installation, and removal would likely be short (8 days to 10 weeks for construction and less than 1 week for removal) and, given the limited area of disturbance within each WEA and across all the WEAs, would cause negligible to minor impacts on benthic habitats.

BOEM has a policy to avoid impacts on sensitive benthic resources. This policy is reflected in BOEM regulations (30 CFR 585.611(b)(5)) that describe the information requirements for a SAP. The G&G Final PEIS (BOEM, 2014a) lists several best management practices for avoiding sensitive benthic resources. Such measures, as applicable, would be incorporated into a SAP as terms and conditions of approval. Additionally, BOEM would coordinate the review of a SAP with NMFS and determine if the impacts of the activities proposed in the SAP are covered within the range of impacts assessed in this section and Section 4.4.2.7 to ensure that all assessment obligations pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) are met.

Non-Routine Events

Collisions between vessels and allisions between vessels and meteorological towers and buoys is considered unlikely (Section 3.3.2 of this EA), and an average of 88 gallons of fuel could be discharged (USCG, 2011), as described in Section 3.3.3. However, in the unlikely event that a vessel allision or collision causes a spill, the most likely pollutant to be discharged would be diesel fuel. If a diesel fuel spill were to occur, it would be expected to dissipate rapidly in the water column, then evaporate and biodegrade within a few days (MMS, 2007b), resulting in negligible impacts on the area of the spill.

Conclusion

Impacts of the proposed action on benthic communities would be short in duration and negligible to minor in geographic extent. In the event that diesel fuel is spilled as a result of an allision or collision, the spill would be expected to dissipate quickly and the impact on benthic resources would be **negligible.** The primary impacts on benthic communities would be direct contact by anchors, driven piles, and scour protection systems that could cause crushing or smothering of benthic organisms. These impacts would be localized, given the extent of benthic habitat types on the Atlantic continental shelf, and would only take place in a very small percentage of the total area of the WEAs (less than 0.2%). If a specific area is adversely affected, the recovery of soft-bottom communities in number and diversity of individuals to predisturbance levels may take 1 to 3 years. Recovery of community composition or trophic structure that exploits all ecologic niches available in that particular area may take longer (Continental Shelf Associates, Inc., 2004). Data collected during seafloor sampling would indicate the presence of any potential benthic resources so that sensitive habitat types, such as hard-bottom and live-bottom habitats, would be avoided by the lessee during sub-bottom sampling and when meteorological facility siting decisions are made (in accordance with BOEM policies to avoid impacts on sensitive benthic resources). Therefore, impacts on benthic communities under Alternative A are anticipated to be **negligible** to **minor**.

4.4.2.4 Coastal Habitats

Description of the Affected Environment

The PEIS (MMS, 2007a) includes a description of the affected environment for coastal habitats along the Atlantic coast, and is hereby incorporated by reference into this EA. The North Carolina WEAs are offshore of the Atlantic coastal plain. This plain is a flat stretch of land that borders the Atlantic Ocean for approximately 2,200 miles from Cape Cod through the southeastern United States.

Impact Analysis of Alternative A

The proposed WEAs are between 10 and 27 nm from the shoreline. Therefore, the construction, operation, and decommissioning activities of meteorological towers and buoys would have no direct impact on coastal habitats. However, the use of existing coastal and port facilities (onshore support activity) for towers and buoys has the potential to contribute to the impacts on coastal habitats.

Routine Activities

Several existing fabrication sites, staging areas, and ports in North Carolina, South Carolina, and Virginia would support site characterization surveys and the construction, operation, and decommissioning of meteorological towers and buoys. No expansion of these existing onshore areas is anticipated. Existing channels could accommodate the vessels anticipated to be used, and no additional dredging would be required to accommodate different vessel size(s). In addition, no cables would be installed to shore to support the meteorological towers or buoys. The meteorological tower platform would be constructed onshore at an existing fabrication yard near one of the ports. The meteorological tower could also be fabricated at various facilities or at inland facilities in sections, and then shipped by truck or rail to the port staging area.

Non-Routine Events

WEA-related vessels traveling to or from the ports for survey activities, installation, maintenance, and decommissioning of meteorological towers and buoys could experience spills within a channel or bay that could potentially reach shoreline areas. The impacts on coastal habitats would depend on the type of material spilled, the size and location of the spill, the meteorological conditions at the time, and the speed with which cleanup plans and equipment could be employed. These impacts are expected to be minimal because vessels are expected to comply with USCG regulations at 33 CFR 151 relating to the prevention and control of oil spills. Based on the distance from shore where proposed action activities would occur and the rapid evaporation and dissipation of diesel fuel, a spill occurring in the one of the WEAs would likely not contact shore. Collisions between vessels and allisions between vessels and meteorological towers and buoys are unlikely. However, if a vessel collision or allision were to occur, and in the unlikely event that a spill would result, the most likely pollutant to be discharged into the environment would be diesel fuel. Diesel dissipates very rapidly in the water column, then evaporates and biodegrades within a few days (MMS, 2007b), resulting in negligible, if detectable, impacts on the area of the spill.

Conclusion

No direct impacts on coastal habitats are anticipated from routine or non-routine activities in the WEAs due to the distance of the WEAs from shore. Existing ports or industrial areas are expected to be used in support of Alternative A. In addition, no anticipated expansion of existing facilities is expected to occur as a result of Alternative A. Therefore, impacts on coastal habitats would be **negligible**.

4.4.2.5 Marine Mammals

Description of the Affected Environment

The G&G Final PEIS (BOEM, 2014a) includes a description of the affected environment for marine mammals and is hereby incorporated by reference into this EA. The G&G Final PEIS (BOEM, 2014a) identifies 38 species of marine mammals representing three taxonomic orders—Cetacea (baleen whales, toothed whales, dolphins, and porpoises), Sirenia (manatee), and Carnivora (true seals)—that occur in the Mid-Atlantic and South Atlantic planning areas, including the areas offshore North Carolina that could be affected by the proposed action analyzed in this EA. Table 4-5, below, identifies the species of marine mammals that have potential to occur within the proposed action area. A description of each marine mammal species or species group (where appropriate), including current status, distribution, and behavior, is available for review in the G&G Final PEIS (BOEM, 2014a) and hereby incorporated by reference. Because of concerns raised specifically over possible impacts on North Atlantic right whale migration caused by survey vessel traffic between the Wilmington West and Wilmington East WEAs during scoping, this EA includes an analysis of the existing conditions in the vicinity of these two WEAs with respect to North Atlantic right whale presence.

Table 4-5
Marine Mammals that May Occur in the Proposed Action Area

Common Name	Scientific Name	Federal Status	Potential to Occur in Proposed Action Area
Sei Whale	*Balaenoptera borealis*	ESA Endangered MMPA Depleted	May occur summer/fall
North Atlantic Right Whale	*Eubalaena glacialis*	ESA Endangered MMPA Depleted	May occur year-round
Humpback Whale	*Megaptera novaeangliae*	ESA Endangered MMPA Depleted	May occur fall/winter/ spring
Bryde's Whale	*Balaenoptera edeni*	MMPA	May occur fall/winter
Minke Whale	*Baleanoptera acutorostrata*	MMPA	Very low likelihood summer/fall/winter
Fin Whale	*Balaenoptera physalus*	ESA Endangered MMPA Depleted	May occur most likely fall/winter
Harbor Porpoise	*Phocoena phocoena*	MMPA	May occur fall/winter

Common Name	Scientific Name	Federal Status	Potential to Occur in Proposed Action Area
Short-beaked Common Dolphin	*Delphinus delphis*	MMPA	May occur winter
Western North Atlantic Bottlenose Dolphin	*Tursiops truncatus*	MMPA	May occur summer/fall/ winter/spring
Atlantic Spotted Dolphin	*Stenella frontalis*	MMPA	May occur year-round
Risso's Dolphin	*Grampus griseus*	MMPA	May occur year-round
Long-finned Pilot Whale	*Globicephala melas*	MMPA	May occur year-round
Short-finned Pilot Whale	*Globicephala macrorhynchus*	MMPA	Low likelihood year-round
Harbor Seal	*Phoca vitulina*	MMPA	May occur fall/winter/ spring
Harp Seal	*Pagophilus groenlandicus*	MMPA	Very low likelihood winter
West Indian Manatee	*Trichechus manatus latirostiris*	ESA Endangered	Low likelihood summer
ESA = Endangered Species Act MMPA = Marine Mammal Protection Act			

North Atlantic Right Whales

North Atlantic right whales use coastal waters on or near the continental shelf for calving and rearing young, foraging, and seasonal migration between feeding grounds and calving grounds. Calving by North Atlantic right whale is known to take place in more southerly locales during the winter months of December to March, while focused feeding is a summertime activity that occurs in the more northerly extent of its range (Mate et al., 1997). Whales could potentially come into the vicinity of the WEAs during any of these activities but are most likely to encounter the WEAs during their migration between northerly foraging grounds and southerly calving grounds.

Standardized aerial surveys conducted along the southeastern coast of the U.S. have been useful for documenting customary North Atlantic right whale calving areas and habitat characteristics associated with sighting locations. Data collected by Keller et al. (2006) during a 4-year period show that North Atlantic right whale distribution is nonrandom in relation to SST; in the application of a habitat model, peak sightings of North Atlantic right whales occur where SST is between 13°C and 15°C and depths measure 10 to 20 meters (Keller et al., 2012). These surveys focused on the single identified North Atlantic right whale calving ground on the continental shelf off northern Florida and Georgia. While these surveys show that North Atlantic right whale calving is primarily centered over 450 km to the south of the Wilmington West and

Wilmington East WEAs, habitat modeling using appropriate habitat characteristics determined that suitable calving habitat exists as far north as Cape Fear, NC, encompassing both the Wilmington West and Wilmington East WEAs (Keller et al., 2012).

During migration from northern summer feeding grounds to their winter calving grounds, North Atlantic right whales are known to follow the coastline, staying on or near the continental shelf in waters less than 182 meter deep (Mate et al., 1997). This pattern leads to the conclusion that North Atlantic right whales are likely to migrate through or near the WEAs. Mate et al. (1997) showed that North Atlantic right whales actively avoid warm water areas such as warm water gyres and the Gulf Stream, preferentially selecting waters less than 20°C during feeding and migrating. The Gulf Stream parallels the coastline, typically flowing outside of the continental shelf, bringing warm water from the south to the north. Monitoring of SST in the vicinity of the WEAs over 5 consecutive years by Stegman and Yoder (1994) indicates that the Gulf Stream is closest to shore in November, farthest from shore by January–March, and moves onshore again in April–May. This pattern was determined by tracking the position of the 18°C isotherm that indicates the inshore edge of the Gulf Stream. While there were fluctuations in the distance from shore of the 18°C isotherm between years, the isotherm was between 20 and 100 km from shore immediately north of the Wilmington West and Wilmington East WEAs. The continental shelf extends offshore approximately 100 km in the vicinity of the Wilmington West and Wilmington East WEAs, which are between 22 and 88 km from shore.

Figure 4-7 shows that North Atlantic right whale distribution from 1977–2014 within the WEAs is low with limited sightings over all seasons, mostly made up of one to two individuals, including cow/calf pairs, in the immediate surrounding areas. Spring followed by winter show the highest seasonal occurrence in the vicinity around the WEAs.

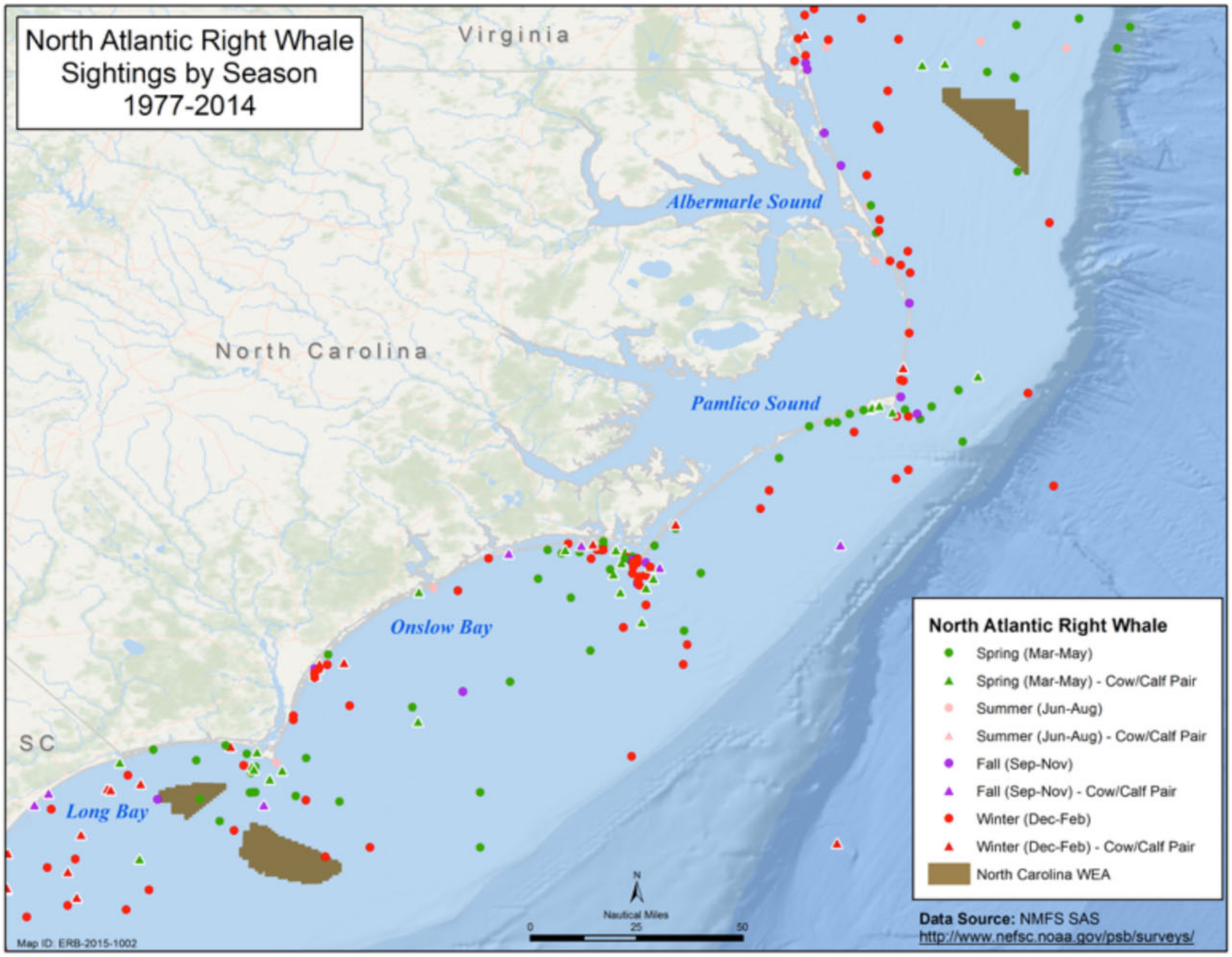


Figure 4-7 **Sightings of North Atlantic Right Whales by Season along the North Carolina Coast, 1977–2014**

The winter calving period for North Atlantic right whales falls between December and March in the coastal waters of the southeastern United States (Kenney et al., 1995). NOAA's Meteorological Buoy 41108 became operational on March 19, 2013 and is located between the Wilmington West and Wilmington East WEAs (Figure 4-8). Data from this buoy for 2013–2015 indicate that December and January have the highest occurrence of days where SSTs fall between 13°C and 15°C, with just a few days in March, April, and November (NOAA, 2015). Notably, average minimum and maximum winter temperatures fall between 9.5°C and 11.8°C over this period, colder than predicted for North Atlantic right whales. However, acoustic recorders located offshore central North Carolina from June 2012–April 2013 detected North Atlantic right whale vocalizations throughout this study period, with peak presence in November–April (86% of daily presence occurring within this period) (Rice et al., 2014).

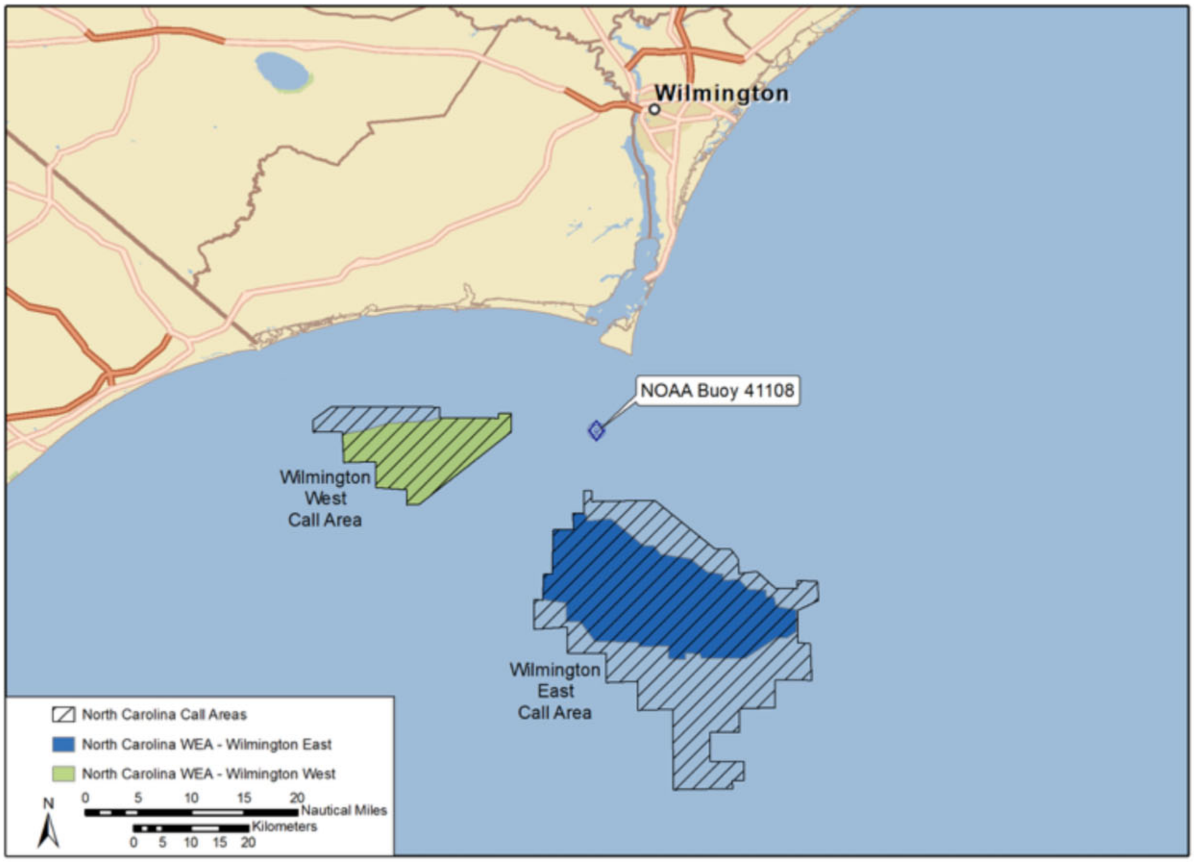


Figure 4-8 **Location of NOAA Meteorological Buoy 41108, between the Wilmington West and Wilmington East WEAs**

Although there are temporal and spatial gaps in these datasets, and actual numbers and locations of individuals from the acoustic data are indeterminable, all these datasets support previous studies that suggest that some North Atlantic right whales, including cow/calf pairs, utilize the habitat in the vicinity of the WEAs, but rarely within the WEAs, as part of their migratory corridor (Pabst et al., 2009).

North Atlantic Right Whale Critical Habitat (Proposed)

On February 20, 2015, NMFS published a proposed rule to expand critical habitat for North Atlantic right whales in the North Atlantic, adding two new areas (80 FR 9314). Proposed Critical Habitat Unit 2 includes marine waters from Cape Fear, NC, southward to 29°N latitude (approximately 43 miles north of Cape Canaveral, Florida). The Wilmington West WEA and a small portion of the Wilmington East WEA (less than 15 square kilometers (km^2) of the proposed critical habitat boundary) overlap with Unit 2 areas in the proposed rule (Figure 4-9).

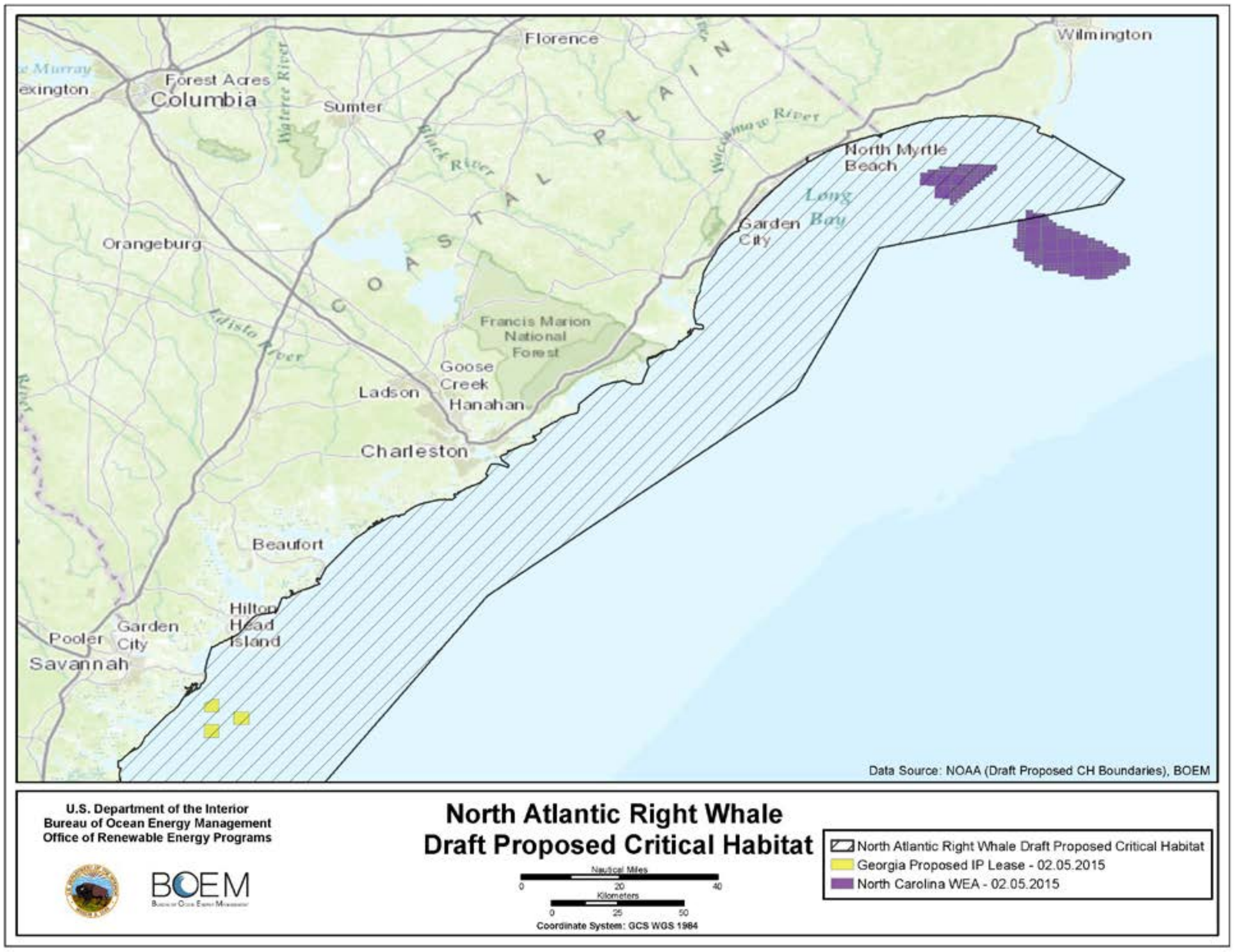


Figure 4-9 **Proposed North Atlantic Right Whale Critical Habitat in Relation to Wilmington West and East WEAs (Purple).**

The critical habitat in the areas that overlap the WEAs is based on habitat suitable for North Atlantic right whale calving. Per NOAA's comment letter, the physical features of North Atlantic right whale calving habitat that are essential to the conservation of the North Atlantic right whale are:

1. Calm sea surface conditions of Force 4 or less on the Beaufort Wind Scale,
2. Sea surface temperatures from a minimum of 7°C, and never more than 17°C, and
3. Water depths of 6 to 28 meters.
4. Where the previous three features simultaneously occur over contiguous areas of at least 231 km^2 during the months of November through April.

As discussed above under *North Atlantic Right Whales*, North Atlantic right whale calving is primarily centered over 450 km to the south of the Wilmington West and Wilmington East WEAs, and although habitat modeling using appropriate habitat characteristics requires more systematic collection of data in these areas and additional analyses, the model predicted that suitable calving habitat exists as far north as Cape Fear, NC (Keller et al., 2012).

Impact Analysis of Alternative A

Impacts on marine mammals from site characterization activities under the proposed action are covered by the analysis of the geophysical and geotechnical activities in the G&G Final PEIS (BOEM, 2014a) and are hereby incorporated by reference. The impacts analyzed in the G&G Final PEIS (BOEM, 2014a) include acoustic sound sources, vessel and equipment noise, vessel traffic, trash and debris release, and accidental fuel spills. These same impacts will not be further addressed in this EA. The G&G Final PEIS (BOEM, 2014a) analysis of impacts on marine mammals from G&G survey activities associated with renewable energy surveys concluded that:

- Impacts of active acoustic sound sources are expected to be minor.
- Impacts from vessel and equipment noise are expected to be negligible to minor.
- Impacts from vessel traffic are expected to be negligible.
- Impacts from trash and debris release are expected to be negligible.
- Impacts from accidental fuel spills are expected to negligible to minor.

It should be noted that while the assessment of impacts on marine mammals from acoustic sound sources, vessel and equipment noise, vessel traffic, trash and debris release, and accidental fuel spills in the G&G Final PEIS (BOEM, 2014a) was for G&G-related activities only, these same impacts would potentially occur for the proposed action covered in this EA. There will be a different number of vessel trips for activities covered in this EA, but the overall impact types on marine mammals are the same and the impact level and conclusions are anticipated to be the same. Therefore, these potential marine mammal impacts will not be further addressed, and the analysis below will focus on the new and different potential marine mammal impacts that could result under the proposed action of this EA. Activities associated with the proposed action analyzed herein that may affect marine mammals include noise from pile driving construction, loss of habitat (water column habitat and benthic habitat), and prey abundance and distribution effects during meteorological tower and/or buoy construction, operation, and decommissioning.

Routine Activities

The primary underwater effects on marine mammals would be the noise generated from pile driving that could affect marine mammals during installation of piles to support meteorological towers. As with any sound in the marine environment, the type and intensity of the sound is dependent on multiple factors and can vary greatly. These factors include the type and size of the pile, the type of substrate, the depth of the water, and the type and size of the impact/vibratory hammer (Madsen et al., 2006). Despite the potential for variance between areas and equipment, the following information attempts to capture the pile driving range of acoustic impacts from existing literature and actual measurements of underwater sound from pile driving.

Impact Pile Driving

Studies have reported that pile driving can generate SPLs greater than 200 dB re 1 micropascal (μPa), with a relatively broad bandwidth of 20 Hz to more than 20 kHz (Madsen et al., 2006; Thomsen et al., 2006; Nedwell and Howell, 2004; Tougaard et al., 2008). In Appendix 5-11A (Noise Report) of the Cape Wind EIS (MMS, 2009b), modeling for construction of a commercial wind turbine foundation indicates that the underwater noise levels from pile driving may be greater than the NMFS MMPA threshold for behavioral disturbance/harassment (160 dB re 1 μPa root mean square [RMS]) from a non-continuous source (i.e., pulsed) within approximately 2.1 miles (3.4 km) of the source. Actual measures of underwater sound levels during the construction of the Cape Wind meteorological tower in 2003 were reported between 145–167 dB re 1 μPa (RMS) at 1,640 feet (500 meters) (see Table 4-6). Peak energy was reported around 500 Hz (BOEM, 2012b).

Modeling was also conducted for proposed meteorological tower sites offshore of New Jersey and Delaware under Interim Policy leases by Bluewater Wind, LLC. The 160 dB re 1 μPa (RMS) isopleth was modeled at 7,230 meters (23,721 feet) for Delaware and 21,654 feet (6,600 meters) for New Jersey (USDOI, BOEM, OREP, 2012). It should be noted that the sources are different sizes, the monopile diameters differ, and the environmental characteristics are likely different, causing the isopleths to vary. However, the information from the Cape Wind EIS and Bluewater Wind, LLC is a good representation of the potential range of ensonified area with both the 180 dB re 1 μPa (RMS) and 160 dB re 1 μPa (RMS) SPLs (Table 4-6).

Table 4-6
Modeled Range at Two Sound Pressure Levels within the Ensonification Area Produced by Pile Driving

Project (modeled)	Additional Info	180 dB re 1 μPa (RMS)	160 dB re 1 μPa (RMS)	120 dB re 1 μPa (RMS)
Bluewater Wind (Interim Policy Lease offshore Delaware)	10-foot- (3.0-meter-) diameter monopile; 900 kJ hammer	2,493 feet (760 meters)	23,721 feet (7,230 meters)	N/A
Bluewater Wind (Interim Policy Lease offshore New Jersey)	10-foot- (3.0-meter-) diameter monopole; 900 kJ hammer	3,281 feet (1,000 meters)	21,654 feet (6,600 meters)	N/A
Cape Wind Energy Project (Lease in Nantucket Sound)	16.57-foot- (5.05-meter-) diameter monopole; 1,200 kJ hammer	1,640 feet (500 meters)	11,155 feet (3,400 meters)	N/A

Project (modeled)	Additional Info	180 dB re 1 μPa (RMS)	160 dB re 1 μPa (RMS)	120 dB re 1 μPa (RMS)
Naval Facilities Engineering Command (2013), page 40; California Department of Transportation (2009) (Appendix 1)	2- to 6-foot- (0.6- to 1.8-meter-) diameter monopoles; vibratory hammer	33 feet (≤ 10 meters)	N/A	> 22,966 feet (7,000 meters)
Source: Adapted from: USDOI, BOEM, OREP, 2012. Key: kJ = kilojoule				

Vibratory Pile Driving

Pile driving can also be completed with a vibratory, rather than an impact, hammer. Vibratory hammers use oscillatory hammers that vibrate the pile, causing the sediment surrounding the pile to liquefy and allow pile penetration. Peak SPLs for vibratory hammers can exceed 180 dB; however, the sound from these hammers rises relatively slowly and the sound energy is spread out over time. As a result, sound levels are generally 10 to 20 dB lower than for impact pile driving (Caltrans, 2009).

The noise levels produced by vibratory pile driving were modeled by the Navy in its request for incidental harassment authorization for the Wharf C-2 recapitalization project at Naval Station Mayport in Florida (U.S. Department of the Navy, 2013). The 180 dB re 1 μPa (RMS) isopleth was modeled at less than 2.4 feet (0.74 meter) and the 120 dB re 1 μPa isopleth was modeled at 22,966 feet (7,356 meters) (Table 4-6).

As with impact pile driving, it should be noted that differences in monopile diameters, pile types, and environmental characteristics can lead to different isopleths under different project conditions. However, because of the greater attenuation of vibratory pile driving noise compared with impact pile driving noise, the potential range of the ensonified area within the 180 dB re 1 μPa (RMS) SPL would be expected to be much smaller for vibratory pile driving than for impact pile driving (Table 4-6).

Underwater Noise Impacts on Marine Mammals

Currently, impacts on marine mammals from in-water acoustic sources are based on levels that can cause behavioral harassment and/or physiological damage or injury. Under the MMPA, NMFS has established thresholds that determine these impacts, which are based on the RMS metric of SPL. The SPL RMS for threshold criteria, as established by NMFS, are:

- 180 dB re 1 μPa (RMS) or greater for potential injury to cetaceans (Level A),
- 190 dB re 1 μPa (RMS) for pinnipeds in water for potential injury to pinnipeds (Level A),
- 160 dB re 1 μPa (RMS) for behavioral disturbance/harassment for non-continuous/impulsive noise to pinnipeds (in water) and cetaceans (Level B), and

- 120 dB re 1 μPa (RMS) for behavioral disturbance/harassment from continuous noise to pinnipeds (in water) and cetaceans (Level B).

These thresholds have been developed based on limited experimental studies on captive odontocetes, controlled field experiments on wild animals, behavioral observations of wild animals exposed to anthropogenic sounds, and inferences from marine mammal vocalizations as well as inferences on hearing studies in terrestrial animals. Despite the current threshold criteria, individual marine mammal reactions to sound can vary, depending on a variety of factors such as age and sex of the animal, prior noise exposure history of the animals that may have caused habituation or sensitization, the behavioral and motivational state of the animal at the time of exposure (e.g., if the animal is feeding and does not find it advantageous to leave its location), habitat characteristics, environmental factors that affect sound transmission, and location of the animal (e.g., distance from the shoreline) (NRC, 2003). Nonetheless, the threshold levels referenced above are considered conservative based on the best available scientific information.

During meteorological tower construction, noise generated by pile driving may be audible to marine mammals. Unmitigated acoustic interference and disturbance could cause behavioral changes, masking of inter- and intra-specific calls, and disruption of echolocation capabilities. The potential for behavioral reactions may extend out many miles (Madsen et al., 2006; Tougaard et al., 2008). Near-field behavioral reactions could result in avoidance of or flight from the sound source, avoidance of feeding habitat, changes in breathing patterns, or changes in response to predators (Watkins and Schevill, 1975; Malme et al., 1984; Richardson et al., 1995; Mate et al., 1997; Nowacek et al., 2007; Tyack, 2009). Depending on the frequency and source level of the noise generated during pile driving, physiological effects such as temporary threshold shift and permanent threshold shift could occur at close range to the source (Richardson et al., 1995; Madsen et al., 2006). Currently, the biological consequences of hearing loss or behavioral responses to construction noise are not fully known (Tougaard et al., 2008), and there is little information regarding short-term and long-term impacts on marine mammal populations from such activity. A recent study in a large embayment (Moray Firth) in northeastern Scotland suggested that mid- and low-frequency cetaceans, such as minke whales and bottlenose dolphins, could experience behavioral disturbance (at 160 dB re 1 μPa [RMS] or greater according to NMFS MMPA criteria) up to approximately 50 km (30 nm) away from the source, and potential injury such as permanent or temporary threshold shifts (at 180 dB re 1 μPa [RMS] or greater according to NMFS MMPA criteria) within 328 feet (100 meters) of the source (Bailey et al., 2010). Although it is important to note this study, the geology of Moray Firth and size of the piles (5-megawatt wind turbine foundations) are not directly transferable to meteorological tower construction in the Atlantic OCS offshore North Carolina. While there is the potential for individual animals to perceive the pile driving activity at great distances, it is not expected to affect entire populations of marine mammals.

It is expected that some species of marine mammals will leave the area when construction vessels arrive and begin their activities (Dähne et al., 2013). This would greatly reduce their exposure to the noise source. It is expected that marine mammals that left the area during construction would be able to return to the area following the completion of the work (i.e., 3 days as estimated in BOEM’s BA [BOEM, 2014b]).

The Massachusetts EA (BOEM, 2014c) discusses at length the potential effects on various types of whales in response to airguns (similar to pile driving and relied on because no data for behavior changes from pile driving are available). Mysticetes (blue, fin, sei, and minke whales) tend to avoid seismic sounds from airguns by remaining significantly farther from the sound source during seismic activity than non-seismic periods (Stone and Tasker, 2006 as reported in BOEM, 2014c). Behavioral reactions may vary depending on the activity of the whale. Migrating bowhead whales (which belong to the same family as North Atlantic right whales) showed significant behavioral disturbance in the form of avoidance out to a distance of 20 to 30 km (11 to 16 nm) from a medium-sized airgun with multiple pulses at received levels of approximately 120 to 130 dB re 1 μPa (RMS) (Southall et al., 2007 as reported in BOEM, 2014c). However, bowhead whales were not as sensitive to seismic sounds during feeding and typically began to show avoidance at received levels of 160 to 170 dB re 1 μPa (RMS), presumably because of the higher energetic cost to stop foraging (NSF and USGS, 2011 as reported in BOEM, 2014c). Also being balaenids, and assumed to respond the same way as the bowhead whale, North Atlantic right whales would be at greater risk of exposure from these sound types and levels while feeding. For all other low-frequency cetaceans (including bowhead whales not migrating), the onset of behavioral reaction was around 150 to 160 dB re 1 μPa (RMS) (Southall et al., 2007 as reported in BOEM, 2014c).

North Atlantic right whales may be present in the vicinity of the WEAs year round, but most likely during winter. BOEM has implemented conservative protective measures for all ESA-listed species by prohibiting all pile driving operations from November 1 through April 30, thus avoiding the period with the highest likelihood of species presence in the WEAs. Exposure of mysticetes to high levels of pile driving noise from May 1 to October 31 will be minimized by the required daylight-only operations, monitoring of an exclusion zone of 3,281 feet (1,000 meters) for all marine mammals by NMFS-approved protected species observers, and by the "soft start" method to warn animals away from the vicinity.

The frequency range for pile driving operations overlaps with the hearing range for all odontocetes (toothed whales such as sperm whales and dolphins), and pile driving noise would therefore be audible. However, the limited data on effects of multiple pulse noise, such as pile driving, on these mid-frequency cetaceans indicate variable reactions between and within species (Southall et al., 2007 as reported in BOEM, 2014c). An example of behavioral change is increased surfacing by sperm whales. Additionally, pile driving would be capable of masking strong vocalizations by bottlenose dolphins within 6.2 to 9.3 miles (10 to 15 km) and weak vocalizations up to 25 miles (40 km) (BOEM, 2014c).

Impact Pile Driving

It is anticipated that potentially injurious noise levels (Level A harassment, as established by NMFS and discussed above) for marine mammals could occur within 3,280 feet (1,000 meters) of the impact pile driving activity and that acoustic behavioral disturbance/harassment (Level B, as established by NMFS and discussed above) from impact pile driving could occur within 4 miles (7 km) of the impact pile driving activity. Construction of a meteorological tower would take place over a relatively short period and would be limited to a maximum of three locations placed over 307,590 acres of the three offshore areas. All impact pile driving would also be prohibited during the mid-Atlantic Seasonal Management Area period of November 1 through

April 30 for the protection of the federally listed North Atlantic right whale, which would benefit other marine mammals in the North Carolina WEAs.

As an SOC, BOEM will require a default exclusion zone of 3,281 feet (1,000 meters) to be established around the sound source and monitored during all pile driving activities. The default exclusion zone will be monitored from two locations. At least two protected species observers on simultaneous watch will be based at or near the sound source and will be responsible for monitoring out to 1,641 feet (500 meters) from the sound source and notifying the resident engineer to halt pile driving activity if a marine mammal is observed entering the exclusion zone. At least two additional protected species observers on simultaneous watch will be located on a separate vessel navigating approximately 3,281 feet (1,000 meters) around the pile hammer and will be responsible for monitoring the area between 1,641 feet (500 meters) to 3,281 feet (1,000 meters) from the sound source and notifying the resident engineer to halt pile driving activity if a marine mammal is observed entering the exclusion zone. Therefore, BOEM anticipates that no marine mammals will be exposed to injurious levels of sound greater than 180 dB (RMS), as pile driving would not occur should a marine mammal enter within 3,281 feet (1,000 meters) of the sound source. In addition, noise effects from pile driving would occur over a relatively short period (approximately 3 days for foundation installation). Potential impacts from impact pile driving are therefore anticipated to be **moderate**.

NOAA is currently revising its acoustic threshold criteria, and should these, as well as any updated, field-verified, or modeled acoustic data become available, BOEM will take the new information into consideration and determine whether the SOCs require modification in order to reflect the results of the new data.

Vibratory Pile Driving

It is expected that potentially injurious noise levels for marine mammals (Level A harassment (180 dB re 1 μPa [RMS]) would occur within 33 feet (10 meters) of any vibratory pile driving activity; this range is expected to be smaller for vibratory pile driving than for impact pile driving (Table 4-6). Disturbance/harassment (Level B) levels of sound (i.e., 120 dB re 1 μPa [RMS]) from vibratory pile driving would occur within approximately 4 miles (7 km) of any vibratory pile driving activity. As with impact pile driving, as an SOC, BOEM will require a default exclusion zone of 3,281 feet (1,000 meters) to be established around the sound source and monitored during all pile driving activities. The default exclusion zone will be monitored from two locations. At least two protected species observers on simultaneous watch will be based at or near the sound source and will be responsible for monitoring out to 1,641 feet (500 meters) from the sound source and notifying the resident engineer to halt pile driving activity if a marine mammal is observed entering the exclusion zone. At least two additional protected species observers on simultaneous watch will be located on a separate vessel navigating approximately 3,281 feet (1,000 meters) around the pile hammer and will be responsible for monitoring the area between 1,641 feet (500 meters) to 3,281 feet (1,000 meters) from the sound source and notifying the resident engineer to halt pile driving activity if a marine mammal is observed entering the exclusion zone. This exclusion zone is designed to ensure that no marine mammals will be exposed to sound levels greater than 180 dB re 1 μPa (RMS). Vibratory pile driving would be prohibited during the mid-Atlantic Seasonal Management Area period of November 1 through April 30. In addition, construction of meteorological towers would take place over a relatively short period and would be limited to a maximum of three locations placed over 307,590 acres of the three offshore areas. As a result, any noise-related disturbances are anticipated to be discreet and brief; therefore, impacts from vibratory pile driving would be **moderate**.

Meteorological Tower/Buoy Installation Water Quality Effects

Installation of piles and/or anchor systems associated with towers or buoys may lead to localized suspended sediments. These impacts would be of short duration and limited to the immediate area surrounding the piles or anchors. This activity could conceivably affect marine mammals by displacing a small amount of forage items that would otherwise be available to these species. However, due to the limited utilization of the benthic environment by marine mammal species found in the proposed action area, small footprint of disturbance, temporary nature of the action, and likely availability of similar benthic habitat in the area, it is anticipated that these impacts would be **negligible**.

Meteorological Tower/Buoy Operation

The presence of the tower structure underwater could potentially affect changes in prey abundance within the immediate area (closer than 20 meters) of the foundation (Andersson and Öhman, 2010). The underwater portions of the tower could lead to schooling of fish around the structures and would provide a new surface for benthic organisms to colonize in areas where this type of habitat did not previously exist. Marine mammals could be attracted to this habitat and the benthic organisms as an additional food source or to feed on schooling fish. However, despite the possible localized changes in prey abundance and distribution, any potential changes would unlikely affect the overall distribution of any marine mammals. Therefore, any effects on marine mammal distribution and foraging would be **negligible**.

Loss of Habitat, and Prey Abundance and Distribution Effects

The presence of meteorological towers and buoys below the water surface would displace substrate and water column habitat for marine mammals. A loss of this habitat could affect marine mammals that may be moving through the area by forcing them to change direction to avoid the structure, resulting in a disruption in their behavior. However, the aquatic habitat displaced by a tower or buoy would be extremely small compared to available aquatic habitat in the surrounding area. Marine mammals are highly mobile and would be expected to avoid tower and buoy areas and utilize the vast areas of aquatic habitat around these structures. In addition, there would be a low density of towers and buoys, with a maximum of three towers or six buoys (or combination of the two) placed over 307,590 acres of the three offshore lease areas. Therefore, it is anticipated that these impacts would be **negligible.**

Meteorological Tower and Buoy Decommissioning

Removal of the piles by cutting below the surface of the substrate would result in a localized impact on the substrate while the cutter accesses the pile 4 to 5 meters below the substrate surface. This activity may result in localized increases in suspended sediment. Increased suspended sediments reduce the ability of some marine mammals to forage and will likely result in some marine mammals leaving the area. Suspension of substrates can result in the suspension of forage, leading to opportunistic feeding and resultant benefit to some marine mammals. These effects are anticipated to be of very short duration and restricted to the immediate vicinity of the piles or anchor system. Depending on the removal technique used, tower decommissioning could also generate noise, but because only non-explosive techniques will be used and no pile driving is required (see Section 3.2.2.5), decommissioning noise is not anticipated to affect marine mammals. The short duration and small footprint of meteorological tower and/or buoy decommissioning indicate that any potential impacts on marine mammals would be **negligible**.

Non-Routine Events

Collisions between vessels and allisions between vessels and meteorological towers and buoys are considered unlikely, as discussed in Section 3.3.2, and accidental fuel spills were analyzed in the G&G Final PEIS (BOEM, 2014a). Storms may also contribute to allisions and collisions that could result in a spill; however, the storm conditions would cause the spill and its effects to dissipate faster. Overall, impacts on marine mammals from diesel spills resulting from collisions and allisions, should they occur, are expected to be minimal and temporary. In the unlikely event that a vessel allision or collision causes a spill, diesel fuel would likely be discharged into the surrounding waters. If a diesel fuel spill were to occur, the average volume would 88 gallons (USCG, 2011). Furthermore, diesel fuel would be expected to dissipate rapidly in the water column, then evaporate and biodegrade within a few days (MMS, 2007b).

Federally Listed Marine Mammals

A description of the affected environment and impacts from site characterization activities on federally listed marine mammals under the proposed action is covered by the analysis of the geophysical and geotechnical activities in the G&G Final PEIS (BOEM, 2014a) and hereby incorporated by reference. The impacts analyzed in the G&G Final PEIS (BOEM, 2014a) include acoustic sound sources, vessel and equipment noise, vessel traffic, trash and debris release, and accidental fuel spills. These same impacts will not be further addressed in this EA. Activities associated with the proposed action analyzed herein that may affect federally listed marine mammals include noise from pile driving construction, loss of habitat (water column habitat and benthic habitat), and prey abundance and distribution effects during meteorological tower and/or buoy construction, operation, and decommissioning. Section 7(a)(2) consultation documents related to the BO associated with the G&G Final PEIS (NMFS, 2013a) are hereby incorporated by reference. Table 4-5, above, includes listed marine mammals that may occur in the proposed project action area. The G&G Final PEIS (BOEM, 2014a), G&G PBA (BOEM, 2012c), and NMFS G&G BO (NMFS, 2013a) addressed the following impacts on federally listed marine mammals from renewable energy surveys:

- Impacts from active acoustic sound sources,
- Impacts from vessel and equipment noise,
- Impacts from vessel traffic,
- Impacts from trash and debris,
- Seafloor disturbance associated with bottom-founded monitoring buoys and bottom sampling, and

- Impacts from accidental fuel spills.

The conclusion of NMFS's G&G BO (NMFS, 2013a) was that these impacts would not likely jeopardize the continued existence of federally listed marine mammals.

Four currently federally listed marine mammals (all endangered whales)—fin whale, sei whale, North Atlantic right whale, and humpback whale—could occur in North Carolina's WEAs, and given the geographic scope of the proposed action, these whales could reasonably be expected to come into contact with meteorological tower activities. The potential impacts on the whales under the proposed action for activities not covered under the NMFS G&G BO (NMFS, 2013a) would include noise from pile driving construction, loss of water column habitat, and prey abundance and distribution effects during meteorological tower construction, operation, and decommissioning.

Routine Activities

Pile Driving and Meteorological Tower Installation

A discussion related to potential behavioral changes in marine mammals, including ESA-listed whale species, from underwater noise is provided above. Pile driving would be short term and temporary (4 to 8 hours per day over 3 days for each tower), and SOCs to reduce noise impacts would include a seasonal prohibition on pile driving, exclusion zones, and "soft start" procedures. However, despite these measures, it is anticipated that whales could still be exposed to noise levels where whales may experience temporary adverse impacts equivalent to Level B harassment. According to ESA regulations, if the effects of the proposed action cannot be shown to be insignificant or discountable and if any incidental take is anticipated to occur, the appropriate determination for listed whale species is *likely to adversely affect*.

Site Characterization Surveys

Reasonably foreseeable activities resulting from lease issuance would be limited to site characterization surveys (e.g., geophysical and geotechnical surveys) and the installation of meteorological and oceanographic buoys. These activities fall within activities for which BOEM has a completed Section 7 Consultation (NMFS G&G BO [NMFS, 2013a]). On June 16, 2015, NMFS concurred with BOEM's determination that no additional consultation would be conducted prior to issuing leases and approving site assessment plans for buoys. All renewable energy leases that are issued offshore North Carolina will include the reasonable and prudent measures for non-airgun surveys and vessel strike avoidance measures that were included in the incidental take statement in the NMFS G&G BO (NMFS, 2013a). Survey plans from lessees offshore North Carolina would be reviewed to ensure that they are wholly consistent with the programmatic consultation (NMFS 2013a). Meteorological tower construction was not included in the NMFS G&G BO (NMFS, 2013a). If a site assessment plan describing meteorological tower installation is submitted to BOEM, BOEM will initiate Section 7 Consultation with NMFS for said activity (see BOEM letter to NMFS regarding consultation for the proposed action and NMFS concurrence letter in Appendix E).

Evidence suggests that collisions of ships with North Atlantic right whales are a major source of injury and mortality (Kraus, 1990). Current North Atlantic right whale distribution data shows that North Atlantic right whales generally occur within 50 km from the shore and are mostly distributed outside of the Wilmington West and Wilmington East WEAs (Figure 4-7). This current distribution suggests that amongst other environmental factors, warm Gulf Stream waters located between 20 and 100 km from shore, immediately north of the Wilmington West and Wilmington East WEAs, could constrain migrating whales to a pathway that includes the Wilmington West and Wilmington East WEAs, which could increase the potential for whales to be struck by ships in the Wilmington TSS or vessels conducting activities associated with site characterization and site assessment activities. However, considering the current patterns of North Atlantic right whale distribution outside of the WEAs (Figure 4-7), the limited scope of the proposed action, generally limited and widespread occurrence of whales recorded in these areas, and the vessel strike avoidance measures that will be followed by all survey vessels, the likelihood of North Atlantic right whales being funneled between the Wilmington West and Wilmington East WEAs and into the TSS, thereby increasing collisions, as a result of the proposed activities, is low. Potential increases in vessel strikes to North Atlantic right whales would be a **minor** to **moderate** impact.

If BOEM receives a site assessment plan for offshore North Carolina that describes proposed actions not covered in the NMFS G&G BO (NMFS, 2013a), BOEM will consult with NMFS in order to determine whether re-initiation of consultation is necessary.

Meteorological Tower/Buoy Operation

It is anticipated that effects from loss of water column habitat, prey abundance and distribution effects, and tower decommissioning would result in short-term behavioral changes, but these effects are anticipated to be insignificant and discountable.

North Atlantic Right Whale Critical Habitat (proposed)

Activities associated with site characterization, site assessment, or installation of offshore meteorological towers and/or buoys would not substantially affect sea surface roughness, sea surface temperatures, or sea water depths.

Fragmentation could occur from physical devices or electromagnetic fields (Boehlert et al., 2010). Installation and operation of meteorological towers and/or buoys would not fragment large, contiguous areas of suitable calving habitat because these features would not create a density of physical structures that could result in a “wall effect” that could cause whales to avoid portions of the critical habitat. A single meteorological tower and/or two buoys with associated power and anchorage cables would have a combined footprint of less than 0.5 km^2. This small footprint positioned within the 220 km^2 Wilmington West WEA would not have a significant effect on any cow/calf pairs that might transit the Wilmington West WEA, and no fragmentation of proposed critical habitat is anticipated from the presence of a meteorological tower and/or two buoys. The effects of the installation and operation of a meteorological tower and/or two meteorological buoys to the contiguity of proposed critical habitat would not be significant.

Avoidance of areas can be caused from by a variety of stimuli that elicit a negative response in whales. Some negative reactions to stimuli appear to result from being startled (new or sudden noises, cessation of noise, loud noises), the perception of danger (approaching vessel), or discomfort (loud noises) (Watkins, 1985). Activities associated with the installation of meteorological towers and/or buoys would occur only during daylight hours and under the constant monitoring of protected species observers, who will ensure that appropriate exclusion zones are maintained around vessel operations, as per the SOCs. Vessels will observe activity-appropriate procedures, for example, ramp-up procedures, continuous visual monitoring of exclusion zones, and shutdown requirements, should a listed species enter the exclusion zone.

While there may be some initial avoidance of meteorological towers and/or buoys by cow/calf pairs, cetaceans are known to habituate rapidly to most stimuli, so any effects caused by the towers would be minor and of short duration (Watkins, 1985). After repeated exposure to equipment (floats, hydrophones, cables) or circumstances, North Atlantic right whales have been known to acclimate to the presence of equipment (Watkins, 1985). This would indicate that installation of meteorological towers and/or buoys would not alter North Atlantic right whale behavior over the long term or fragment habitat. Therefore, effects on proposed North Atlantic right whale critical habitat would be **negligible** to **minor**.

Conclusion

There could be potential effects on marine mammals from pile driving, loss of water column habitat, prey abundance and distribution effects, and tower decommissioning. It is anticipated that effects from loss of water column habitat, prey abundance and distribution effects, and tower decommissioning would result in short-term behavioral changes, but these effects are anticipated to be negligible. Pile driving would be short-term and temporary (4 to 8 hours per day over 3 days for each tower), and SOCs to reduce noise impacts would include a seasonal prohibition on pile driving, establishment and constant monitoring of exclusion zones, and "soft start" procedures. However, despite these measures, it is anticipated that whales could still be exposed to noise levels where whales may experience temporary adverse impacts equivalent to Level B harassment. Effects from pile driving activities are therefore anticipated to be **moderate**.

If BOEM receives a site assessment plan that describes activities not covered in the NMFS G&G BO, BOEM will consult with NMFS (see BOEM letter to NMFS regarding consultation for the proposed action and NMFS concurrence letter in Appendix E).

Based on the above analysis, effects on marine mammals, including those that are federally listed (with the exception of North Atlantic right whales during the migration season from November 1 through April 30), from site characterization survey activities (e.g., surveys) would be **negligible** to **minor**. Effects from site assessment activities (e.g., meteorological tower installation) would be **negligible** to **moderate** (from pile driving). Effects on North Atlantic right whales due to potential increases in vessel strikes either through funneling North Atlantic right whales into the TSS during both site characterization and site assessment activities or from increases in vessel traffic as a result of project-related activities would be **minor** to **moderate**. Based on the short duration of operations and the small footprint of meteorological towers and/or buoys within the Wilmington West WEA, effects caused by fragmentation of the proposed critical habitat for North Atlantic right whales would be **negligible** to **minor**. Effects on marine mammals from non-routine events such as vessel fuel spills, even those resulting from storms, would be temporary and limited in size and area of dispersal before fuel evaporated and biodegraded. Therefore, these effects would be **negligible** to **minor**.

Standard Operating Conditions for Marine Mammals

BOEM has developed SOCs applicable to site characterization and site assessment activities that minimize or eliminate potential impacts on protected species, including ESA-listed species of marine mammals. Many of these SOCs are discussed in the analysis above and are described in detail in Appendix B. However, for reader ease, because site assessment activities are not covered by the NMFS G&G BO (NMFS, 2013a), SOCs that are required to be implemented during meteorological tower installation (i.e., pile driving) are listed in their entirety here. All these SOCs were developed by BOEM and refined during previous consultations under Section 7 of the ESA with NMFS. Additional conditions and/or revisions to the conditions below may be developed during consultation with NMFS for site assessment activities not covered by the NMFS G&G BO (NMFS, 2013a).

Because of the greater risk of injury to cetaceans and pinnipeds (as well as sea turtles) from pile driving, BOEM has adopted a conservative shutdown requirement that would apply to all incursions into the exclusion zone during pile driving. The 3,281-foot (1,000-meter) default exclusion zone is based upon the field of ensonification at the 180 dB re 1 μPa (RMS) level and upon previous reports to BOEM on modeled areas of ensonification from pile driving activities. The following outlines the SOCs that BOEM will require to minimize or eliminate potential impacts on marine mammals.

1. **Visibility.** The Lessee must not conduct pile driving for a meteorological tower foundation at any time when lighting or weather conditions (e.g., darkness, rain, fog, sea state) prevent visual monitoring of the exclusion zones for meteorological tower foundation pile driving as specified below. This requirement may be modified as specified below (#2).
    a. If the driving of a pile commenced during daylight hours, the Lessee may complete driving that pile after daylight hours. However, the Lessee or operator may not start driving a new pile after daylight hours, unless allowed pursuant to an alternative monitoring plan as described in #2 below.
2. **Modification of Visibility Requirement**. If the Lessee intends to conduct pile driving for a meteorological tower foundation at night or when visual observation is otherwise impaired, the Lessee must submit to BOEM an alternative monitoring plan detailing the alternative monitoring technologies (e.g., active or passive monitoring technologies). The alternative monitoring plan must demonstrate the effectiveness of the methodology proposed to BOEM's satisfaction. BOEM may, after consultation with NMFS, decide to allow the Lessee or operator to conduct pile driving for a meteorological tower foundation at night or when visual observation is otherwise impaired using the proposed alternative monitoring methodology.
3. **Protected-Species Observer (PSO).** The Lessee must ensure that the exclusion zone for all pile driving for a meteorological tower foundation is monitored by NMFS-approved PSOs around the sound source. The number of PSOs must be sufficient to effectively

monitor the exclusion zone at all times. In order to ensure effective monitoring, PSOs must not be on watch for more than 4 consecutive hours, with at least a 2-hour break after a 4-hour watch, unless otherwise allowed by BOEM. PSOs must not work for more than 12 hours of any 24-hour period. The Lessee must provide to BOEM a list of PSOs and their résumés no later than 45 calendar days prior to the scheduled start of meteorological tower construction activity. The résumés of any additional PSOs must be provided 15 calendar days prior to each PSO's start date. BOEM will send the observer information to NMFS for approval.

4. **Observation Location.** The Lessee must ensure that monitoring occurs from the highest available vantage point on the associated operational platform, allowing for 360-degree scanning.

5. **Optical Device Availability.** The Lessee must ensure that reticle binoculars or other suitable equipment are available to each PSO to adequately perceive and monitor protected species within the exclusion zone during construction activities.

6. **Pre-Construction Briefing.** Prior to the start of construction, the Lessee must hold a briefing to establish responsibilities of each involved party, define the chains of command, discuss communication procedures, provide an overview of monitoring purposes, and review operational procedures. This briefing must include construction supervisors and crews, and the PSO(s) (see further below). The Resident Engineer (or other authorized individual) will have the authority to stop or delay any construction activity, if deemed necessary by the Resident Engineer. New personnel must be briefed as they join the work in progress.

7. **Prohibition on Pile Driving.** The Lessee must ensure that no pile driving activities (e.g., pneumatic, hydraulic, or vibratory installation of foundation piles) occur from November 1–April 30 or during an active Dynamic Management Area (DMA) if the pile driving location is within the boundaries of the DMA as established by NMFS. Any pile driving outside of the DMA are required to remain at a distance such that received levels at these boundaries are no more than Level B harassment as determined by field verification or modeling.

8. **Establishment of Exclusion Zone.** The Lessee must ensure the establishment of a default 3,281-foot (1,000-meter) radius exclusion zone for cetaceans, sea turtles, and pinnipeds around each pile driving site. The 3,281-foot (1,000-meter) exclusion zone must be monitored from two locations. At least two observers on simultaneous watch must be based at or near the sound source and will be responsible for monitoring out to 1,640 feet (500 meters) from the sound source. At least two additional observers on simultaneous watch must be located on a separate vessel navigating approximately 3,281 feet (1,000 meters) around the pile hammer and will be responsible for monitoring the area between 1,650 and 3,281 feet (500 and 1,000 meters) from the sound source.

9. **Field Verification of Exclusion Zone**. The Lessee or operator must conduct acoustic monitoring of pile driving activities during the installation of each foundation requiring pile driving. Acoustic measurements must take place during the driving of the last half (deepest pile segment) for any given open water pile. The Lessee or operator must take acoustic measurements at a minimum of two reference locations that would be sufficient to establish the following: source level (peak at 1 meter) and distance to the 207, 180,

166, 160, and 150 dB re 1 μPa (RMS) SPL isopleths as well as the 187 dB re 1 μPa cumulative sound exposure level (cSEL) and 206 peak decibels (dB_{peak}). Such sound measurements must be taken at the reference locations at two depths (i.e., a depth at midwater and a depth at approximately 1 meter above the seafloor). Sound pressure levels must be measured in the field in dB re 1 μPa (RMS) and reported.

10. **Modification of Exclusion Zone.** The Lessee may use the field verification method described below to modify the default exclusion zone provided above for pile driving activities. Results of the field verification must be submitted to BOEM after driving the first pile and before driving subsequent piles for a multiple-pile foundation. The results of the measurements must be used to establish a new exclusion zone, which may be greater than or less than the 3,281-foot (1,000-meter) default exclusion zone, depending on the results of the field tests. Any new exclusion zone radius must be based on the most conservative measurement (i.e., the largest safety zone configuration) of the target (180 dB or 160 dB) zone. The Lessee must obtain BOEM's approval for any new exclusion zone before it may be implemented.

11. **Clearance of Exclusion Zone**. The Lessee must ensure that visual monitoring of the exclusion zone must begin no less than 60 minutes prior to the beginning of "soft start" and continue until pile driving operations cease or sighting conditions do not allow observation of the sea surface (e.g., fog, rain, or darkness) (refer to #1 above). If a cetacean, pinniped, or sea turtle is observed, the PSO must note and monitor the position, relative bearing, and estimated distance to the animal until the animal dives or moves out of visual range of the PSO. The PSO must continue to observe for additional animals that may surface in the area. The Lessee must ensure that pile driving operations do not begin until the PSO has reported the exclusion zone clear of all cetaceans, pinnipeds, and sea turtles for at least 60 minutes.

12. **Implementation of "Soft Start."** The Lessee must ensure that a "soft start" be implemented at the beginning of each pile installation in order to provide additional protection to cetaceans, pinnipeds, and sea turtles near the project area by allowing them to vacate the area prior to the commencement of pile driving activities. The Lessee must ensure the following at the beginning of each day's in-water pile driving activities or when pile driving has ceased for more than 1 hour: The impact hammer soft start requires three strike sets, with a minimum of three strikes per set. A 1-minute wait period must occur between each strike set. The initial strike set will be at approximately 10% energy, the second strike set at approximately 25% energy, and the third strike set at approximately 40% energy. The "soft start" procedure should not be less than 20 minutes. Strikes may continue at full operational power following the "soft start" period. For vibratory hammers, the "soft start" requires initiation of noise from the hammers for 15 seconds at reduced energy, followed by a 1-minute waiting period. This procedure must be repeated two additional times, after which the vibratory hammer can be operated at full operational power.

13. **Shutdown for Cetaceans, Pinnipeds, and Sea Turtles**. The Lessee must ensure that any time a cetacean, pinniped, or sea turtle is observed within the exclusion zone, the PSO must notify the Resident Engineer (or other authorized individual) and call for a shutdown of pile driving activity. Any disagreement or discussion should occur only after shutdown, unless such discussion relates to the safety of the timing of the cessation of the

pile driving activity. Subsequent restart of the pile driving equipment may only occur following clearance of the exclusion zone of any cetacean, pinniped, or sea turtle for at least 60 minutes.

14. **Pauses in Pile Driving Activity**. The Lessee must ensure that if pile driving ceases for 30 minutes or more and a cetacean, pinniped, or sea turtle is sighted within the exclusion zone prior to re-start of pile driving, the PSO(s) must notify the Resident Engineer (or other authorized individual) that an additional 60-minute visual and acoustic observation period must be completed, as described above, before restarting pile driving activities. A pause in pile driving for less than 30 minutes must still begin with "soft start" but will not require the 60-minute clearance period as long as visual surveys were continued diligently throughout the silent period and the exclusion zone remained clear of cetaceans, pinnipeds, and sea turtles. If visual surveys were not continued diligently during the pause of 30 minutes or less, the Lessee must ensure that the exclusion zone is clear of all cetaceans, pinnipeds, and sea turtles for at least 60 minutes prior to the commencement of a "soft start" and subsequent pile driving.

4.4.2.6 Sea Turtles

Description of the Affected Environment

The G&G Final PEIS (BOEM, 2014a) identifies five species of sea turtles that occur in the Mid-Atlantic and South Atlantic Planning areas, including the areas offshore North Carolina (Table 4-7). These include the loggerhead turtle (*Caretta caretta*), green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), Kemp's ridley turtle (*Lepidochelys kempii*), and leatherback turtle (*Dermochelys coriacea*). All five of these species are federally listed as threatened or endangered under the federal ESA. A description of each sea turtle species, including current status, range and distribution, behavior, conservation and management, and ecology and life history is available for review in the G&G Final PEIS (BOEM, 2014a) and is hereby incorporated by reference.

Table 4-7
Sea Turtle Potential for Occurrence in the Proposed Action Area

Common Name	Scientific Name	Federal Listing Status	Potential to Occur in Proposed Action Area
Loggerhead Turtle	*Caretta caretta*	Threatened	May occur year-round
Green Turtle	*Chelonia mydas*	Endangered	May occur year-round
Hawksbill Turtle	*Eretmochelys imbricata*	Endangered	Low likelihood year-round
Kemp's Ridley Turtle	*Lepidochelys kempii*	Endangered	May occur year-round
Leatherback Turtle	*Dermochelys coriacea*	Endangered	May occur year-round

Most of the offshore areas along the coast of North Carolina have been designated as loggerhead sea turtle critical habitat. The previously proposed Kitty Hawk Call Area overlapped with designated migratory critical habitat for loggerhead sea turtle. The Kitty Hawk WEA as proposed in this EA no longer overlaps with any designated critical habitat areas for loggerhead sea turtles (Figure 4-10). However, primary constituent elements (PCEs) for loggerhead sea turtle are present in areas adjacent to the WEAs. The PCEs for loggerhead sea turtle winter habitat are: (1) water temperatures above 10°C from November through April; (2) continental shelf waters in proximity to the western boundary of the Gulf Stream; and (3) water depths between 20 and 100 meters. The PCEs for migratory habitat are: (1) constricted continental shelf area relative to nearby continental shelf waters that concentrate migratory pathways and (2) passage conditions to allow for migration to and from nesting, breeding, and/or foraging areas. Additionally, although located farther offshore than any of the WEAs, *Sargassum* sea turtle foraging habitat covers the entire offshore area along North Carolina.

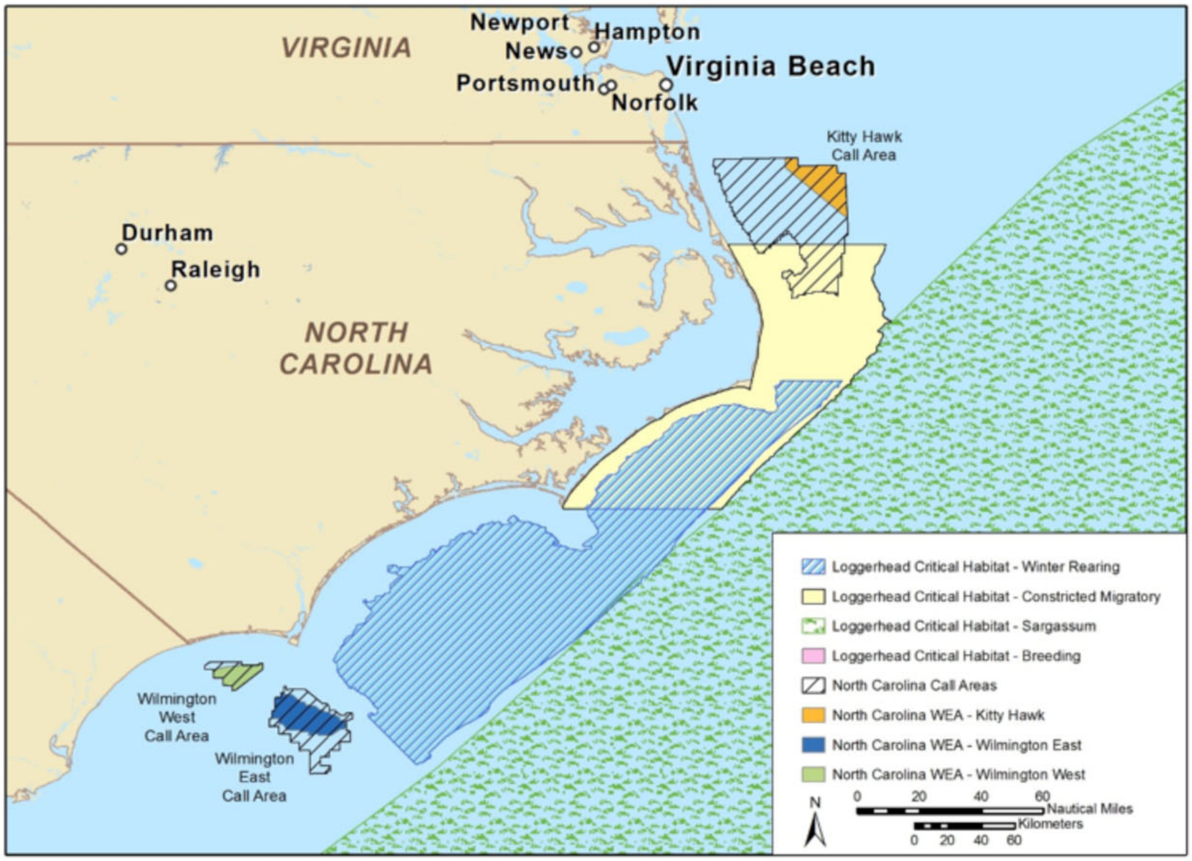


Figure 4-10 Loggerhead Sea Turtle Critical Habitat

Impact Analysis of Alternative A

The impacts analyzed in the G&G Final PEIS (BOEM, 2014a) include acoustic sound sources, vessel and equipment noise, vessel traffic, trash and debris release, and accidental fuel spills and are not discussed further here. Activities associated with the proposed action analyzed herein that may affect federally listed sea turtles include noise from pile driving construction, loss of habitat (water column habitat and benthic habitat), and prey abundance and distribution effects during meteorological tower and/or buoy construction, operation, and decommissioning. Potential impacts on sea turtles that could occur as a result of the geophysical and geotechnical survey activities associated with the proposed action were included in Section 7(a)(2) consultation documents (G&G PBA and associated NMFS G&G BO associated with the G&G Final PEIS [BOEM, 2014a]), and are hereby incorporated by reference. The G&G Final PEIS (BOEM, 2014a), G&G PBA, and NMFS G&G BO addressed the following impacts on sea turtles from renewable energy surveys:

- Impacts from active acoustic sound sources,
- Impacts from vessel and equipment noise,

- Impacts from vessel traffic,
- Impacts from trash and debris,
- Seafloor disturbance associated with bottom-founded monitoring buoys and bottom sampling, and
- Impacts from accidental fuel spills.

The conclusion of NMFS G&G BO was that these impacts would not likely jeopardize the continued existence of federally listed sea turtles.

The potential impacts on sea turtles for the proposed action described in this EA are addressed in BOEM's BA (BOEM, 2014b). The potential impacts on sea turtles under the proposed action (and not covered under the G&G PBA and NMFS G&G BO for G&G activities) include noise from pile driving construction, loss of water column habitat, and prey abundance and distribution effects during meteorological tower construction, operation, and decommissioning. In summary, the BA covering the proposed action of this EA concluded the following for federally listed sea turtles:

> Federally listed sea turtles could occur off the shore of North Carolina, and given the geographic scope of the proposed action, sea turtles could reasonably be expected to come into contact with meteorological tower activities. Therefore, meteorological towers may affect the federally listed sea turtles.

It is anticipated that effects from loss of water column habitat, prey abundance and distribution effects, construction, operation, and tower decommissioning would result in temporary behavioral changes, but these effects are anticipated to be insignificant and discountable, and therefore minor. However, pile driving noise could be detectable by sea turtles at low frequencies; if sea turtles were to be close enough to the sound source, the potential for injury could exist and the impact would be moderate. It is highly unlikely that this would happen because of the required SOCs for a 3,281-foot (1,000-meter) exclusion zone and 60-minute all-clear period for pile driving, and the short-term nature of the pile driving activities (4 to 8 hours per day over 3 days for each tower). However, given the larger area of ensonification that results from pile driving and the known occurrences of sea turtles throughout the coastal waters of North Carolina, it can be reasonably assumed that some sea turtles may be exposed to disturbing/harassing levels of noise beyond the 3,281-foot (1,000-meter) exclusion zone. As a result, BOEM concludes that the proposed activity could result in temporary adverse effects on sea turtles during pile driving. According to ESA regulations, if the effects of the proposed action cannot be shown to be insignificant or discountable, and if any incidental take is anticipated to occur, the appropriate determination is *likely to adversely affect*. Therefore, BOEM concludes that the proposed action is *likely to adversely affect* listed sea turtles.

Based upon BOEM's assessment in the BA, BOEM concludes that potential impacts *would not adversely modify* proposed loggerhead sea turtle critical habitat (Figure 4-10). When the BA was submitted to NMFS, loggerhead sea turtle critical habitat was proposed, but has since been finalized (79 FR 39856). Since submission of the BA, the North Carolina WEAs have been modified and no longer overlap with any loggerhead sea turtle designated critical habitat areas; therefore, no determination is necessary.

Construction of meteorological towers would not affect any PCEs for *Sargassum* or winter habitat, as they are not located in PCEs and would not result in the physical harvest or pollution of *Sargassum* nor changes in water temperature, respectively. The PCEs for migratory habitat have also been avoided and meteorological tower placement is not anticipated to impede access to designated critical habitat areas. Therefore, loggerhead sea turtle critical habitat would not be expected to be adversely modified as a result of the proposed action.

Proposed SOCs for marine mammals listed in Section 4.4.2.5 would also minimize and reduce impacts on sea turtles.

Non-Routine Events

Collisions between vessels and allisions between vessels and meteorological towers and buoys are considered unlikely, as discussed in Section 3.3.2. Accidental fuel spills were also analyzed in the G&G Final PEIS (BOEM, 2014a) in relation to marine mammals. Storms may contribute to allision and collision occurrences that could result in a spill; however, the storm conditions would cause the spill and its effects to dissipate faster. Presence of meteorological towers and buoys could serve as attractants for fish, which could increase recreational fishing in the area, leading to potential for collisions between recreational fishing vessels that could result in an accidental release of diesel fuel. Overall impacts on sea turtles resulting from collisions and allisions that caused fuel spills, should they occur, are expected to be minimal and temporary. If a diesel fuel spill were to occur, the average volume would 88 gallons (USCG, 2011). Furthermore, diesel fuel would be expected to dissipate rapidly in the water column, then evaporate and biodegrade within a few days (MMS, 2007b).

Conclusion

The G&G Final PEIS (BOEM, 2014a), G&G PBA (BOEM, 2012c), and NMFS G&G BO (NMFS, 2013a) address impacts on sea turtles associated with renewable energy surveys (the same as site characterization activities described in this EA). NMFS's G&G BO determined that sea turtles would not be jeopardized by these activities, concluding BOEM's ESA Section 7(a)(2) obligations. BOEM's BA for this EA's proposed action has assessed impacts on sea turtles, and has concluded that these activities would *likely adversely affect* sea turtles.

Potential increases in recreational fishing vessels in the area around meteorological towers or buoys could result in fuel spills. Additionally, storms may cause allisions and collisions that could result in a fuel spill; however, the storm conditions would cause the spill and its effects to dissipate faster. Overall impacts on sea turtles from diesel spills resulting from collisions and allisions, should they occur, are expected to be minimal and temporary and would be considered **negligible**.

Reasonably foreseeable activities resulting from lease issuance would be limited to site characterization surveys (e.g., geophysical and geotechnical surveys) and the installation of meteorological and oceanographic buoys. These activities fall within activities for which BOEM has a completed Section 7 consultation (NMFS G&G BO). Survey plans from lessees offshore North Carolina would be reviewed to ensure that they are wholly consistent with the programmatic consultation (NMFS, 2013a). Meteorological tower construction was not included in the NMFS G&G BO. If a site assessment plan describing meteorological tower installation is submitted to BOEM, BOEM will initiate Section 7 consultation with NMFS for said activity (see BOEM letter to NMFS regarding consultation for the proposed action and NMFS concurrence letter in Appendix E).

Based on analyses by BOEM, and consistent with the NMFS G&G BO (NMFS, 2013a), BOEM concludes that impacts on sea turtles from site characterization surveys would be **negligible** to **minor.** Additionally, BOEM has determined that there would be *no adverse modification* to loggerhead sea turtle critical habitat as a result of the surveying activities under the proposed action. Installation of meteorological towers (site assessment) would likely require pile driving, which could result in **minor** to **moderate** effects on sea turtles. In regard to site assessment activities, BOEM concludes that there would be *no adverse modification* to loggerhead sea turtle critical habitat, as there is no overlap between potential lease areas and designated loggerhead sea turtle critical habitat.

4.4.2.7 Finfish and Essential Fish Habitat

Description of the Affected Environment

A description of the affected environment and impacts on Essential Fish Habitat (EFH) from site characterization activities under the proposed action are covered by the analysis of the G&G activities in the G&G Final PEIS (BOEM, 2014a) and are hereby incorporated by reference (Table 4-8). The affected environment encompasses demersal and pelagic habitats ranging from the shoreline to the open ocean that support approximately 600 fish species. The G&G Final PEIS (BOEM, 2014a) focuses on demersal fishes (including hard-bottom and soft-bottom fishes) and pelagic fishes (including coastal pelagic, epipelagic, and mesopelagic fishes). Within the demersal classes, assemblages are characterized by cross-shelf distribution or depth-related patterns. Descriptions of ichthyoplankton (eggs and larvae of fish in water) and EFH are also included.

Table 4-8
Essential Fish Habitat in the Proposed Action Area

Coastal Migratory Pelagics of the Gulf of Mexico and South Atlantic		
Cobia	King mackerel	Spanish mackerel
Coral, Coral Reefs and Live-/Hard-Bottom Habitats of the South Atlantic Region		
Ahermatypic stony corals	Antipatharia (black corals)	Hermatypic stony corals
Octocorals, except Pennatulacea)	Pennatulacea (sea pens and sea pansies)	
Gulf of Mexico/south Atlantic Spiny Lobster		
Slipper lobster	Spiny lobster	
South Atlantic Golden Crab		
Golden crab	Jonah crab	Red crab

South Atlantic Shrimp			
Brown shrimp	Royal red shrimp	White shrimp	
Pink shrimp	Rock shrimp		
South Atlantic Snapper-Grouper			
Almaco jack	French grunt	Porkfish	Smallmouth grunt
Atlantic spadefish	Gag	Puddingwife	Snowy grouper
Banded spadefish	Grass Porgy	Queen snapper	Spanish grunt
Bank sea bass	Gray (Mangrove) snapper	Queen triggerfish	Speckled hind
Bar jack	Graysby	Red grouper	Tiger grouper
Blackfin snapper	Gray triggerfish	Red hind	Tilefish
Black grouper	Greater amberjack	Red porgy	Tomtate
Blueline tilefish	Hogfish	Red snapper	Vermillion snapper
Black margate	Jolthead porgy	Rock hind	Warsaw grouper
Black sea bass	Knobbed porgy	Rock sea bass	Whitebone porgy
Blue runner	Lane snapper	Sailor's choice	White grunt
Black snapper	Lesser amberjack	Sand tilefish	Wreckfish
Bluestriped grunt	Longspine porgy	Saucereye porgy	Yellowedge grouper
Coney	Mahogany snapper	Scamp	Yellowfin grouper
Cottonwick	Margate	Schoolmaster	Yellow jack
Crevalle jack	Misty grouper	Scup	Yellowmouth grouper
Cubera snapper	Mutton snapper	Sheepshead	
Dog snapper	Ocean triggerfish	Silk snapper	
Atlantic Highly Migratory Species			
Atlantic albacore tuna	Atlantic angel shark	Dusky shark	Sandbar shark
Atlantic bigeye tuna	Atlantic sharpnose shark	Finetooth shark	Scalloped hammerhead
Atlantic bluefin tuna	Basking shark	Great Hammerhead	Shortfin mako shark
Atlantic skipjack tuna	Bigeye thresher shark	Lemon shark	Silky shark
Atlantic yellowfin tuna	Blacknose shark	Longfin mako shark	Spinner shark
Atlantic swordfish	Blue marlin	Night shark	Tiger shark
Blue marlin	Blue shark	Nurse shark	Whale shark
Longbill spearfish	Bonnethead shark	Oceanic whitetip shark	White shark
Sailfish	Bull shark	Porbeagle shark	Smooth dogfish
White marlin	Caribbean reef shark	Sand tiger shark	

The impacts analyzed in the G&G Final PEIS (BOEM, 2014a) include acoustic sound sources, vessel and equipment noise, vessel traffic, trash and debris release, and accidental fuel spills. These same impacts will not be further addressed in this EA. Activities associated with the proposed action analyzed herein that may affect EFH include noise from pile driving construction, loss of habitat (water column habitat and benthic habitat), and prey abundance and distribution effects during meteorological tower and/or buoy construction, operation, and decommissioning.

Impact Analysis of Alternative A

The potential impacts on fish resources and EFH that could occur as a result of the G&G survey activities associated with the proposed action were previously analyzed in the G&G Final PEIS (BOEM, 2014a) and are hereby incorporated by reference. The G&G Final PEIS (Table 2-4) (BOEM, 2014a) analyzed impacts on fisheries resources and EFH from G&G activities with renewable energy surveys and concluded that:

- Impacts from active acoustic sound sources are expected to be negligible.
- Impacts from vessel and equipment noise are expected to be negligible.
- Impacts from seafloor disturbance are expected to be negligible.
- Impacts from accidental fuel spills are expected to be minor.

It should be noted that while the assessment of impacts on fish and EFH from acoustic sound sources, vessel and equipment noise, seafloor disturbance, and accidental fuel spills in the G&G Final PEIS (BOEM, 2014a) was for G&G-related activities only, these same impacts would potentially occur for site assessment activities as proposed in this EA. There would be a different number of vessel trips and area of seafloor disturbance for activities covered in this EA, but the overall impact types on fish and EFH are the same and the impact level and conclusions are anticipated to be the same. The following analysis addresses potential impacts on fish and EFH impacts that could result under the proposed action of this EA that were not considered in the G&G Final PEIS (BOEM, 2014a) analysis.

Activities associated with the proposed action that have not yet been analyzed and may affect fish resources and EFH include noise from pile driving construction, loss of habitat (water column habitat and benthic habitat), and prey abundance and distribution effects during meteorological tower and/or buoy construction, operation, and decommissioning.

Routine Activities

The primary underwater noise source that could affect fish species would be pile driving associated with installation of piles to support meteorological towers. As with any sound in the marine environment, the type and intensity of the sound is dependent on multiple factors and can vary greatly. These factors include the type and size of the pile, the type of substrate, the depth of the water, and the type and size of the impact/vibratory hammer (Madsen et al., 2006). Underwater noise levels from impact and vibratory pile driving are described above in Section 4.4.2.5, *Marine Mammals*.

Pile Driving Noise Effects

In estimating the potential effects of noise on fishes, it is important to understand that any sound source produces both pressure waves and actual motion of the medium particles. All fishes detect particle motion, because it directly stimulates the inner ear (Popper et al., 2003). Bony fishes with an air bubble (most often the swim bladder) are also likely to detect pressure signals that are re-radiated to the inner ear as particle motion. Species detecting pressure hear a wider range of frequencies and sounds of lower intensity than fishes without an air bubble, because the bubble re-radiates the received signal, which is then detectable by the ear as a secondary sound source (Popper et al., 2003; Popper and Fay, 2010).

Hearing thresholds have been determined for perhaps 100 fish species; data on hearing thresholds can be found in Fay (1988), Popper et al. (2003), Ladich and Popper (2004), Nedwell et al. (2004), Ramcharitar et al. (2006), and Popper and Schilt (2008). These data demonstrate that, with few exceptions, fishes cannot hear sounds above about 3 to 4 kHz, and the majority of species are only able to detect sounds to 1 kHz or below. Studies of the family Aceripensidae (sturgeons) suggest that the highest frequency they can detect is 800 Hz and that they have relatively poor sensitivity (Lovell et al., 2005; Meyer et al., 2010). There have also been studies on a few species of cartilaginous fishes with results suggesting that they detect sounds to no more than 1,000 Hz and are not very sensitive to sound (Casper et al., 2003).

Literature relating to the impacts of sound on marine fish species can be divided into the following categories: (1) pathological effects, (2) physiological effects, and (3) behavioral effects. Pathological effects include lethal and sublethal physical damage to fish, physiological effects include primary and secondary stress responses, and behavioral effects include changes in exhibited behaviors of fish. Behavioral changes might be a direct reaction to a detected sound or as a result of the anthropogenic sound masking natural sounds that the fish normally detect and to which they respond. The three types of effects are often interrelated in complex ways. For example, some physiological and behavioral effects could potentially lead to the ultimate pathological effect of mortality. Popper and Hastings (2009) recently reviewed what is known about the effects of sound on fishes and identified studies needed to address areas of uncertainty relative to measurement of sound and the responses of fishes.

Hastings et al. (1996) suggested that sounds 90 to 140 dB above a fish's hearing threshold may potentially injure the inner ear of a fish. Hastings et al. (1996) exposed oscar fish (*Astronotus ocellatus*) to synthesized sounds with characteristics similar to those of commonly encountered man-made sources. The only damage observed was in fish exposed for 1 hour to 300 Hz continuous tones at 180 dB re 1 μPa (RMS) at 1 meter, and sacrificed 4 days post-exposure. Enger (1981) provided the earliest evidence of the potential of loud sounds to pathologically affect fish hearing. He demonstrated that the sensory cells of the ears of Atlantic cod (*Gadus morhua*) were damaged after 1 to 5 hours of exposure to continuous synthesized sounds with a source sound pressure level of 180 dB re 1 μPa (RMS) at 1 meter UMT, which denotes unified measure type. The frequencies tested included 50, 100, 200, and various frequencies between 300 and 400 Hz. The cod were exposed at less than 3.3 feet (1 meter) from the sound source. Chapman and Hawkins (1973) found that ambient noise at higher sea states in the ocean have masking effects in cod, haddock, and pollock. Additionally, sound could also produce generalized stress (Wysocki et al., 2006). Therefore, based on limited data, it appears that for fish in general, communication masking and stress may occur, depending on the species, SPL, frequency, and duration of exposure. The only data on mortality associated with sound sources other than explosives come from studies of driving very large piles. For example, the California Department of Transportation (2001) showed some mortality for several different species of wild fishes exposed to driving of steel pipe piles 8 feet (2.4 meters) in diameter. However, mortality does not seem to occur at distances of more than approximately 33 feet (10 meters) from the source.

Unmitigated construction noise could disturb normal behaviors (e.g., feeding) of fish if they were present within the construction area during pile driving activities. However, the "soft start" procedure for pile driving (see *Standard Operating Conditions for Marine Mammals*) is expected to allow fish that may be affected to leave the area.

The pile driving "soft-start" SOC would reduce impacts on fish. This measure will be included as a condition on any leases and/or a term and condition of SAPs approved under this proposed action. Because of the "soft start" procedure, it is anticipated that the majority of fish would flee the area during the period of disturbance and return to normal activity in the area post-construction. Because of the offshore location of the activity and the "soft start" provision, it is not expected that fish species would be exposed to potentially injurious levels of noise, and any underwater noise impacts would be **negligible**.

Loss of Habitat, and Prey Abundance and Distribution

The presence of meteorological towers and buoys below the water surface would displace substrate and water column habitat for fish, and also provide hard benthic substrate, which some fish species prefer. A loss of this habitat could affect fish that may be moving through the area by forcing them to change direction to avoid the structure, resulting in a disruption in their behavior. However, the aquatic habitat displaced by a tower or buoy would be extremely small compared to available aquatic habitat in the surrounding area. Fish are highly mobile and would be expected to avoid tower and buoy areas and utilize the vast areas of aquatic habitat around these structures. In addition, there would be a low density of towers and buoys, with a maximum of three towers or six buoys (or combination of the two) placed over 307,590 acres of the three offshore lease areas. Therefore, it is anticipated that the impacts would be **negligible**.

Meteorological Tower/Buoy Installation Water Quality Effects

Installation of piles and/or anchor systems associated with towers or buoys may lead to localized suspended sediments. These impacts would be of short duration and limited to the immediate area surrounding the piles or anchors. Because of the localized nature and short duration of such activities, effects from suspended sediments would be **negligible** on fish and fish habitat.

Meteorological Tower/Buoy Operation

Some benthic species prefer hard substrate, such as that provided by piles, for attachment and colonization. This may result in a localized increase in such species. Some fish species prefer such habitat and would be expected to benefit from the newly formed hard-substrate habitat.

Given that each lease may have, at most, one meteorological tower or two buoys (or combination of the two), the increase in such species is not anticipated to result in a large-scale shift in species composition. Shifts in habitat assemblage and species composition are expected to be restricted to the meteorological tower or buoy, so effects on fish populations or habitats are anticipated to be **negligible**.

The presence of the tower structure underwater could potentially affect changes in prey abundance within the immediate area (closer than 20 meters) of the foundation (Andersson and Öhman, 2010). The underwater portions of the tower could lead to schooling of fish around the structures and would provide a new surface for benthic organisms to colonize in areas where this type of habitat did not previously exist. Sea turtles could be attracted to this habitat and the benthic organisms as an additional food source. Similarly, individual whales and fish could be attracted to tower foundations to feed on schooling fish or benthic invertebrates that may be present. However, despite the possible localized changes in prey abundance and distribution, any potential changes would be unlikely to affect the overall distribution of any fish species. Therefore, any effects on fish distribution and foraging would be **negligible**.

Meteorological Tower and Buoy Decommissioning

Removal of the piles by cutting below the surface of the substrate would result in a localized impact on the substrate while the cutter accesses the pile 4 to 5 meters below the substrate surface. This activity may result in localized increases of suspended sediment. Increased suspended sediments reduce the ability of some fish to forage and will likely result in some fish fleeing the area. Suspension of substrates can result in the suspension of forage leading to opportunistic feeding and resulting benefit to some fish species. These effects are anticipated to be of very short duration and restricted to the immediate vicinity of the piles or anchor system. The short duration and small footprint lead to the conclusion that effects on fish and fish habitat would be **negligible**.

Meteorological tower decommissioning activities could affect fish due to in-water noise related to removal of the tower. In the case of pile-supported towers, piles would be removed by cutting with a mechanical saw or a high-pressure water jet below the substrate surface. This noise is not anticipated to be any louder than the impacts already described above for pile driving. Pile removal would likely produce sounds within the audible range of fish but would not produce injurious effects. The potential noise impacts from decommissioning would be short term and temporary, and would only last for the duration of the tower removal. The fish species are highly mobile and would be able to avoid the tower area during removal; the noise generated is not anticipated to affect the migratory movement or behavior of fish through the area. Therefore, noise related to tower removal may affect fish, but the effect would be **negligible**.

Non-Routine Events

Collisions between vessels and allisions between vessels and meteorological towers and buoys are considered unlikely, as discussed in Section 3.3.2. Accidental fuel spills were also analyzed in the G&G Final PEIS (BOEM, 2014a) in relation to finfish and EFH. Storms may contribute to allision and collision occurrences that could result in a spill; however, the storm conditions would cause the spill and its effects to dissipate faster. Presence of meteorological towers and buoys could serve as attractants for fish, which could increase recreational fishing in the area, leading to potential for collisions between recreational fishing vessels that could result in an accidental release of diesel fuel. Overall impacts on fish resulting from collisions and allisions resulting in fuel spills, should they occur, are expected to be minimal and temporary. If a diesel fuel spill were to occur, the average volume would 88 gallons (USCG, 2011). Furthermore, diesel fuel would be expected to dissipate rapidly in the water column, then evaporate and biodegrade within a few days (MMS, 2007b).

Federally Listed Fish Species

Two federally listed marine fish—smalltooth sawfish (E) and Atlantic sturgeon (E)—could occur in North Carolina's WEAs. The potential impacts on federally listed fish that could occur as a result of the G&G survey activities associated with the proposed action were previously analyzed in the G&G Final PEIS (BOEM, 2014a) and the Section 7(a)(2) consultation documents (G&G PBA [BOEM, 2012c] and associated NMFS G&G BO associated with the G&G Final PEIS), and are hereby incorporated by reference. The G&G Final PEIS (BOEM, 2014a), G&G PBA (BOEM, 2012c), and NMFS G&G BO (NMFS, 2013a) addressed the following impacts on federally listed fish from renewable energy surveys:

- Impacts from active acoustic sound sources,
- Impacts from vessel and equipment noise,
- Impacts from vessel traffic,
- Impacts from trash and debris,
- Seafloor disturbance associated with bottom-founded monitoring buoys and bottom sampling, and
- Impacts from accidental fuel spills.

The conclusion of NMFS's G&G BO was that these impacts would not likely jeopardize the continued existence of federally listed Atlantic sturgeon and would *not likely adversely affect* federally listed smalltooth sawfish.

The potential impacts on smalltooth sawfish and Atlantic sturgeon from the site characterization activities described in this EA are addressed in BOEM's BA (BOEM, 2014a). The potential impacts on the two fish species under the proposed action (and not covered under the G&G PBA [BOEM, 2012c] and NMFS G&G BO [NMFS, 2013a]) would include noise from pile driving construction, loss of water column habitat, and prey abundance and distribution effects during meteorological tower construction, operation, and decommissioning.

The Atlantic sturgeon occurs in shelf waters during fall and winter months, which would be the time period when pile driving will be prohibited because of the seasonal pile driving prohibition in the mid-Atlantic (November 1–April 30) for the protection of migrating North Atlantic right whales. Furthermore, when present offshore, Atlantic sturgeon are not anticipated to occur in large densities, greatly reducing the likelihood of their exposure to pile driving noise. The smalltooth sawfish historically occurred along the East Coast north to Long Island Sound. However, this range has been greatly reduced over the past 200 years, leaving a single distinct population unit in southwestern Florida. A search of the National Sawfish Encounter Database

(Simpfendorfer and Wiley, 2006), managed by the Florida Museum of Natural History Sawfish Implementation Team, revealed only two recent sightings of smalltooth sawfish: one off Florida and another from Georgia (BOEM, 2014a). Noise generated from pile driving could have pathological, physiological, or behavioral effects on marine fish. Unmitigated construction noise could disturb normal behaviors (e.g., feeding) of ESA-listed fish if they were present within the construction area during pile driving activities. However, the "soft start" procedure for pile driving is expected to allow fish that may be affected to leave the area.

Effects on Federally Listed Fish Species

There could be potential effects on smalltooth sawfish and Atlantic sturgeon from pile driving, loss of water column habitat, prey abundance and distribution, and tower decommissioning. It is anticipated that effects from loss of water column habitat, prey abundance and distribution, and tower decommissioning would result in short-term and temporary behavioral changes, but these effects are anticipated to be insignificant and discountable. Pile driving could disturb normal behavior, resulting in avoidance and flight from the sound source in the event fish are present in the offshore area during pile driving activities. If fish were close enough to the pile driving activity, death could result. However, pile driving would be short term and temporary, and is anticipated to be limited to the time necessary to drive the piles (4 to 8 hours per day over 3 days for each tower). SOCs would also be employed, including the implementation of a "soft start" procedure, which would minimize the possibility of exposure to injurious sound levels by prompting any fish to leave the area prior to exposure to disturbing levels of sound. In addition, because of their current distribution, smalltooth sawfish are unlikely to be exposed to pile driving because the North Carolina WEAs are north of the species' primary distribution (around Florida). The seasonal prohibition on pile driving could limit some potential impacts on Atlantic sturgeon when they would be moving to offshore habitats after spawning, but Atlantic sturgeon could utilize offshore waters where towers would be constructed outside of the seasonal prohibition.

Because BOEM will require a "soft start," it would be unlikely that fish would be close enough to pile driving activities that would result in physiological impacts. Because of the temporary nature of pile driving activities (4 to 8 hours per day), fish would be expected to be able to return to the pile driving area once pile driving stops. Therefore, BOEM concluded that the proposed action would be *not likely to adversely affect* federally listed marine fish. Installation of meteorological towers requires pile driving, which could result in **minor** effects on listed fish. If a lessee proposes these activities in a site assessment plan, BOEM will initiate a Section 7 consultation with NMFS. Impacts on listed fish as a result of the surveying activities as described in the proposed action would be **negligible** (see BOEM letter to NMFS regarding consultation for the proposed action and NMFS concurrence letter in Appendix E).

Conclusion

Meteorological tower and buoy construction and decommissioning noise could disturb normal fish behaviors. Behavioral reactions may include avoidance of, or flight from, the sound source. Fish that do not flee the immediate action area during pile driving procedure could be exposed to lethal SPLs, which could result in adverse effects. However, the project design criteria, including the implementation of a "soft start" procedure, would minimize the possibility of exposure to lethal sound levels, resulting in **minor** effects on fish. The presence of meteorological towers and buoys below the water surface would displace substrate and water column habitat for fish and also provide hard benthic substrate, which some fish species prefer. However, the aquatic habitat displaced by a tower or buoy would be extremely small compared to available aquatic habitat in the surrounding area, and impacts would therefore be **negligible**.

Potential increases in recreational fishing vessels in the area around meteorological towers or buoys could result in fuel spills. Additionally, storms may cause allisions and collisions that could result in a fuel spill, but storm conditions would likely cause the spill and its effects to dissipate faster. Overall impacts on fish resources from diesel spills resulting from collisions and allisions, should they occur, are expected to be minimal and temporary and would be considered **negligible**.

The G&G Final PEIS (BOEM, 2014a), G&G PBA (BOEM, 2012c), and NMFS G&G BO (NMFS, 2013a) address impacts on federally listed fish associated with renewable energy surveys (site characterization) and determined that impacts would be **negligible**. NMFS's BO for the G&G Final PEIS determined that fish would not be jeopardized or adversely affected by these activities, concluding BOEM's ESA Section 7(a)(2) obligations. BOEM's BA for this EA's proposed action has assessed impacts on federally listed fish and concluded that these activities are *not likely to adversely affect* federally listed fish. On June 16, 2015 NMFS concurred with BOEM's determination that site characterization activities and buoy installation were covered under the NMFS BO (NMFS, 2015) for the G&G Final PEIS. BOEM will consult with and submit the BA to the NMFS if a site assessment plan includes installation of meteorological towers that require pile driving, which could result in **minor** effects on federally listed fish species. If a site assessment plan describing meteorological tower installation is submitted to BOEM, BOEM will initiate Section 7 consultation with NMFS for said activity (see BOEM letter to NMFS regarding consultation for the proposed action in Appendix E). Impacts on federally listed fish species as a result of the surveying activities as described in the proposed action would be **negligible**.

4.4.3 Land Use and Coastal Infrastructure

4.4.3.1 Coastal Infrastructure

Description of the Affected Environment

Vessel and crew usage of onshore facilities associated with site characterization have been analyzed in previous EAs (hereby incorporated by reference; see Section 1.5 of this EA for a complete list) and will not be discussed here, as these activities would be the same. Existing major and minor commercial ports, harbors, or industrial areas composing the coastal infrastructure in Virginia, North Carolina, and South Carolina (as described Section 3.2.1.9) could be used when implementing the proposed action. The major ports were analyzed in the G&G Final PEIS (BOEM, 2014a), and activities associated with G&G undertakings require similar facilities and uses as the proposed action activities. The effects analysis in the G&G Final PEIS (BOEM, 2014a) determined that activities associated with seismic and HRG surveys would have a negligible effect on ports and other coastal infrastructure. Some of the smaller ports that could be used for survey or other activities associated with the proposed action include Hatteras

Harbor Marina, NC; Port of Morehead City, NC; Southport Marina, NC; and Port of Georgetown, SC.

Impact Analysis of Alternative A

Undertakings associated with site characterization surveys and assessment activities would be relatively smaller in scale than other ongoing activities within existing ports and would be similar in nature to those activities analyzed in G&G Final PEIS (BOEM, 2014a) and the other BOEM EAs (see Section 1.5), impacts of which were found to be negligible. Activities associated with the proposed action would not require additional coastal infrastructure be constructed, nor would they require expansion of area ports, even if smaller ports are utilized. Therefore, no impacts on coastal infrastructure in the vicinity of the WEAs would be expected.

Conclusion

Use of existing ports and marinas for site characterization and site assessment activities would be consistent with existing uses at those facilities. Furthermore, no additional upland or coastal infrastructure would be required for site characterization and site assessment activities. Therefore, **no effect** on land use or coastal infrastructure would occur as a result of the proposed action.

4.4.3.2 Military Use

Description of the Affected Environment

This section describes military uses in the vicinity of the WEAs. Military activities can include various vessel training exercises, submarine and antisubmarine training, and U.S. Air Force exercises. The U.S. Navy, U.S. Army, USCG, and U.S. Air Force have major and minor military installations located along the coasts of Virginia, North Carolina, and South Carolina (Table 4-9).

Table 4-9
List of Military Installations Located near Major and Minor Ports of Use

Military Installation[1]	Closest Port	Department
Air Station Elizabeth City	Hatteras Harbor Marina, NC	U.S. Coast Guard
Joint Base Charleston	Port of Charleston, SC	U.S. Air Force and Navy
NWS Charleston	Port of Charleston, SC	U.S. Navy
MCAS Cherry Point	Port of Morehead City, NC	U.S. Marine Corps
Camp Lejeune	Port of Morehead City, NC	U.S. Marine Corps
MCAS New River	Port of Morehead City, NC	U.S. Marine Corps
Langley Air Force Base	Port of Virginia, VA	U.S. Air Force
Fort Monroe	Port of Virginia, VA	U.S. Army
Joint Expeditionary Base	Port of Virginia, VA	U.S. Army, Navy, Marine Corps, and Coast Guard
Sector Hampton Roads	Port of Virginia, VA	U.S. Coast Guard
Naval Station Norfolk	Port of Virginia, VA	U.S. Navy
NAB Little Creek	Port of Virginia, VA	U.S. Navy
NAS Oceana	Port of Virginia, VA	U.S. Navy
Military Ocean Terminal Sunny Point	Southport Marina, NC	U.S. Navy

[1] MCAS = Marine Corps Air Station; NWS = Naval Weapons Station; NAB =Naval Amphibious Base; NAS = Naval Air Station.

Source: U.S. Military Bases, 2012.

Vessels and aircraft that conduct operations not compatible with commercial or recreational transportation are typically confined to Military Operating Areas away from commercially used waterways and inside Special Use Airspace. Hazardous operations are communicated to all vessels and operators by use of Notices to Mariners issued by USCG and Notices to Airmen issued by FAA.

Impact Analysis of Alternative A

Interaction with military aircraft and vessels could occur along vessel shipping routes for sampling and survey work and during aviation surveys. Potential use conflicts with military range complexes and civilian space program use are expected to be avoided through coordination with military commanders and the National Aeronautics and Space Administration (NASA) prior to surveys. The Wallops Flight Facility within NASA's Goddard Space Flight Center off the eastern shore of Virginia is the closest NASA launch facility to the WEAs. All authorizations for permitted activities would include guidance for military and NASA coordination. Vessel and aircraft operators would be required to establish and maintain early contact and coordination with the appropriate military command headquarters or NASA point of contact. Military and NASA activities have the potential for creating temporary space-use conflicts on the OCS. The

G&G Final PEIS (BOEM, 2014a) includes guidance for military and NASA coordination in Section 2.1.2.8, incorporated here by reference.

On May 11, 2011, the DOD Office of the Deputy Under Secretary for Personnel and Readiness presented an assessment of offshore military activities and wind energy development on the OCS offshore North Carolina to the NC Task Force. The assessment identified wind exclusion areas where wind energy development would be incompatible with existing military uses. In response to this assessment, BOEM removed all identified wind exclusion areas from further leasing consideration. The assessment also identified areas where site-specific stipulations may be required.

To avoid or minimize potential conflicts with existing DOD activities, site-specific stipulations may be necessary for all OCS blocks within the WEAs. Such stipulations may include, but are not limited to, a hold-and-save-harmless agreement where the lessee assumes all risks of damage or injury to persons or property if such injury or damage to persons or property occurs by reason of the activities of the United States; and/or a requirement that, at times requested by the DOD, the lessee controls its own electromagnetic emissions and those of its agents, employees, invitees, independent contractors, or subcontractors when operating in specified DOD Operating Areas (OPAREAs) or warning areas.

Other examples of stipulations that may be required include a stipulation that the lessee enter into an agreement with the appropriate DOD commander when operating vessels or aircraft in a designated OPAREA or warning area, requiring that these vessel and aircraft movements be coordinated with the appropriate DOD commander, and/or a stipulation that DOD can request temporary suspension of operations and/or require evacuation on the lease in the interest of safety and/or national security.

Conclusion

Based on the removal of wind exclusion areas and the use of site-specific stipulations, impacts on military use from the placement of meteorological towers and buoys are expected to be **negligible**.

4.4.3.3 Navigation/Vessel Traffic

Description of the Affected Environment

This section describes navigation/vessel traffic in the vicinity of the WEAs. Vessels using these ports and navigation routes include cargo ships such as tankers, bulk carriers, and tug and barge units; passenger ferries; naval vessels; government research, enforcement, and search and rescue vessels; pilot boats; and fishing and recreational crafts (USACE, 2012). Shipping densities and vessel types vary, with the highest vessel density levels associated with access routes to the five major and three minor ports listed in Sections 3.2.1.9 and 3.2.1.10, respectively.

Vessel traffic in the vicinity of the WEAs is supported by a network of navigation features, including shipping lanes, TSS (i.e., shipping lanes), and navigational aids. Navigation corridors are incompatible within or close to wind farms; therefore, commercial and military shipping lanes should avoid the areas surrounding the WEAs. Major TSSs around the WEAs include TSSs to the ports of Morehead City (Carteret County) and Wilmington (New Hanover County) (UNC, 2009).

The Atlantic Intracoastal Waterway (AIW) is a naturally protected navigation route that runs parallel to the Atlantic Coast from Massachusetts to Florida. The AIW is maintained by USACE (USACE, 2000). It covers the major and minor ports identified for vessel launches for surveys: Port of Virginia, VA; Port of Wilmington, NC; Port of Charleston, SC; Port of Morehead City, NC; Port of Wanchese, NC; Southport Marina, NC; Hatteras Harbor Marina, NC; and Port of Georgetown, SC. Route A of the AIW, commonly referred to as the Albemarle and Chesapeake Canal Route, extends from the southern branch of the Norfolk Southern Railway Bridge in Virginia to the Virginia/North Carolina state line. It serves as the primary transportation route for the AIW in the area surrounding the Port of Virginia, VA. The primary commodities being shipped along Route A are sand, gravel, crushed rock, and petroleum productions. This route also contains some recreational vessel traffic (USACE, 2000). Route B of the AIW, commonly referred to as the Dismal Swamp Canal Route, extends from the Elizabeth River in Chesapeake, VA to the Pasquotank River, NC. This route is traveled primarily by recreational vessels, with some commercial vessel traffic (USACE, 2000).

The area surrounding the Port of Virginia, VA, contains facilities and vessels for the Army, Navy, Air Force, Marines, and USCG. The headquarters of the Atlantic Fleet is in Norfolk, VA, with the joint service headquarters located at the U.S. Atlantic Command in Norfolk, VA (USACE, 2000).

Maritime commercial ship traffic is an important component of U.S. commerce. According to the U.S. Department of Transportation (USDOT) Maritime Administration (MARAD), two of the five major ports listed in Section 3.2.1.9, Norfolk and Charleston, were included in the top ten United States ports for container freight in 2011 (USDOT MARAD, 2013). In 2011, Norfolk, VA, shipped a total of 11.4 million metric tons of U.S./foreign containers equaling 2,160 vessel calls, and Charleston, SC, shipped a total of 10.0 million metric tons of U.S./foreign containers equaling 1,302 vessel calls (USDOT MARAD, 2013). In 2011, Charleston had a total of 165,000 passengers depart on cruise vessels, an increase from 117,000 passengers in 2010 (USDOT MARAD, 2012). The Port of Wilmington, NC, had a total of 5.3 million tons of container, breakbulk, and bulk shipments in 2013, with 432 ships and 47 barges. The Port of Morehead City, NC, had a total of 1.8 million tons of breakbulk and bulk shipments in 2013, with 121 ships and 446 barges (NCP, 2013). The Port of Wanchese, NC, has an active commercial fishing industry with no freight traffic. In 2006, there were 52 commercial fishing vessels operating out of the Port of Wanchese (NOAA, 2013b). The Southport Marina, NC, supports local recreational vessels along the Intracoastal Waterway at mile 309, Marker 2A. It is a full-service marina with more than 200 in-water boat slips, deep water access, and a fuel dock (Southport Marina, 2014). Hatteras Harbor Marina, NC, is located along the Pamlico Sound and is a full-service marina that supports recreational vessels and a small tourist industry with 20 charter boats, as well as deep water transient slips up to 60 feet deep (Hatteras Harbor Marina, 2014). The Port of Georgetown, SC, is a breakbulk and bulk cargo port with storage areas, an expanded berth needed for maneuvering larger ships, and specialty cargo-handling facilities. It is near U.S. Highway 17 for truck transportation of cargo and has on-terminal rail service from CSX Transportation Services (South Carolina Ports, 2014).

Figures 4-11 through 4-15 show the vessel traffic density analyzed from Automatic Identification System (AIS) data, which indicate shipping traffic was concentrated on areas near the shipping lanes in the vicinity of the entrances to the major ports (Norfolk, Wilmington, and Charleston).

Impact Analysis of Alternative A

Alternative A has two primary activities that could affect navigation/vessel traffic: routine activities (e.g., installation and operation of a meteorological buoy or construction of a meteorological tower, vessel traffic from survey) and non-routine activities (e.g., collision between vessels, allision with structures, accidental fuel discharge) (see Table 4-10).

Increased vessel traffic from these routine and non-routine activities would increase vessel traffic within the WEAs and between the WEAs and shore. This increase in traffic has the potential to directly affect coastal and offshore vessel traffic; see Appendix C for all vessel calculations.

Routine Activities

Increased vessel traffic associated with site characterization surveys and the construction, operation, and decommissioning of meteorological towers/buoys would be anticipated as a result of Alternative A. BOEM assumes that one or two survey vessels would be active in each WEA at any given time to conduct site characterization activities. During the time when meteorological tower/buoy construction, operations, and decommissioning are being conducted, more activities would be expected, such as a vessel to tow and assist in buoy placement or a specialized jack-up vessel for installing foundation pilings for a tower, or during routine maintenance, which would result in two to three vessels at any given time. These trips could occur within and nearby the heavily traveled areas during the time period of the proposed action.

Because the additional vessel activity associated with the proposed action within the WEAs is expected to be relatively small (one to two additional survey vessels during characterization and two to three vessels during the site assessment activities in a given time/space over a period of 5.5 years), BOEM does not anticipate that the number of vessels passing through the WEAs for these activities would significantly increase vessel traffic density levels when compared with the existing and projected future vessel traffic in the WEAs (see Table 4-11).

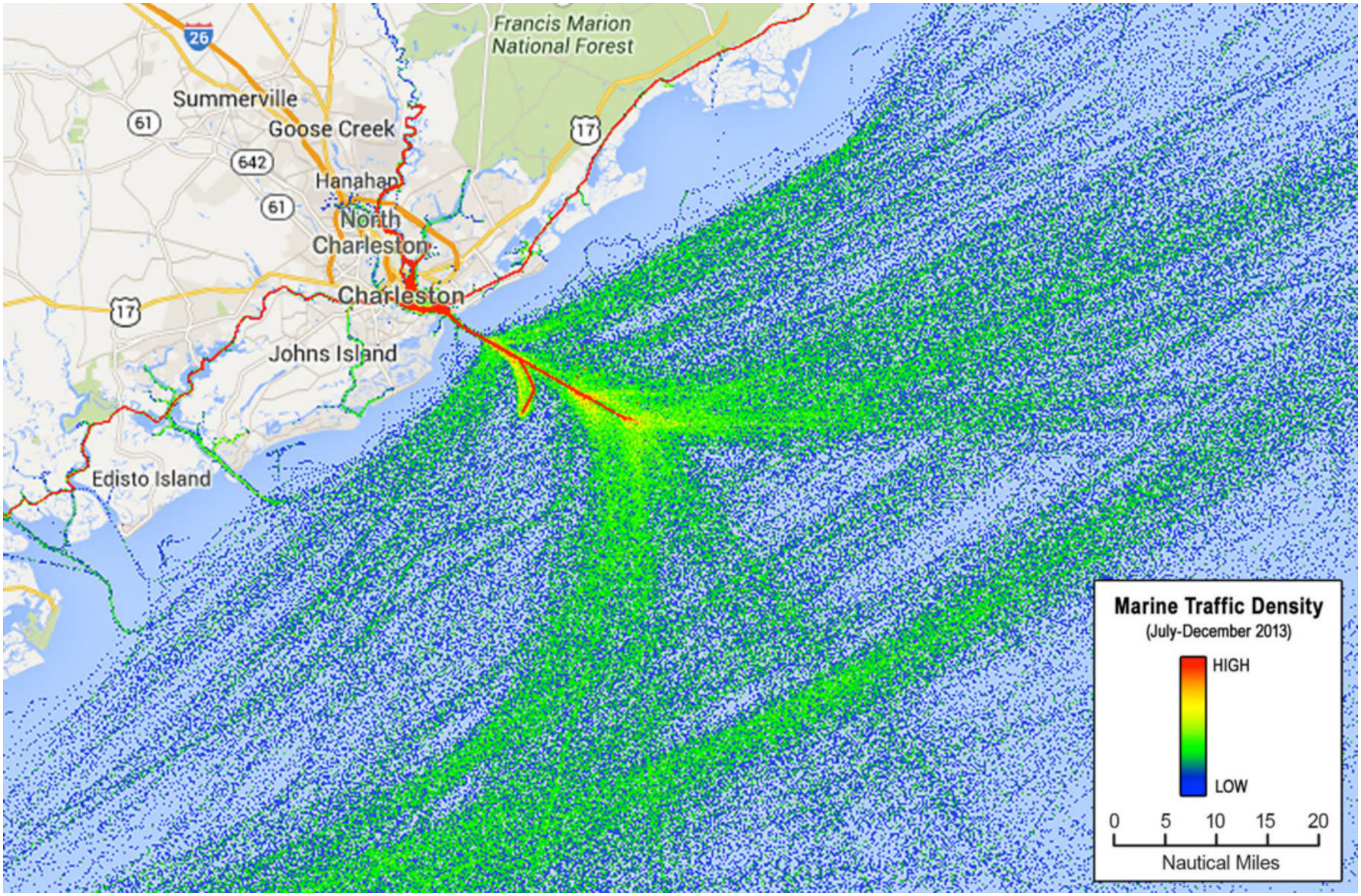


Figure 4-11 **Charleston Vessel Density**

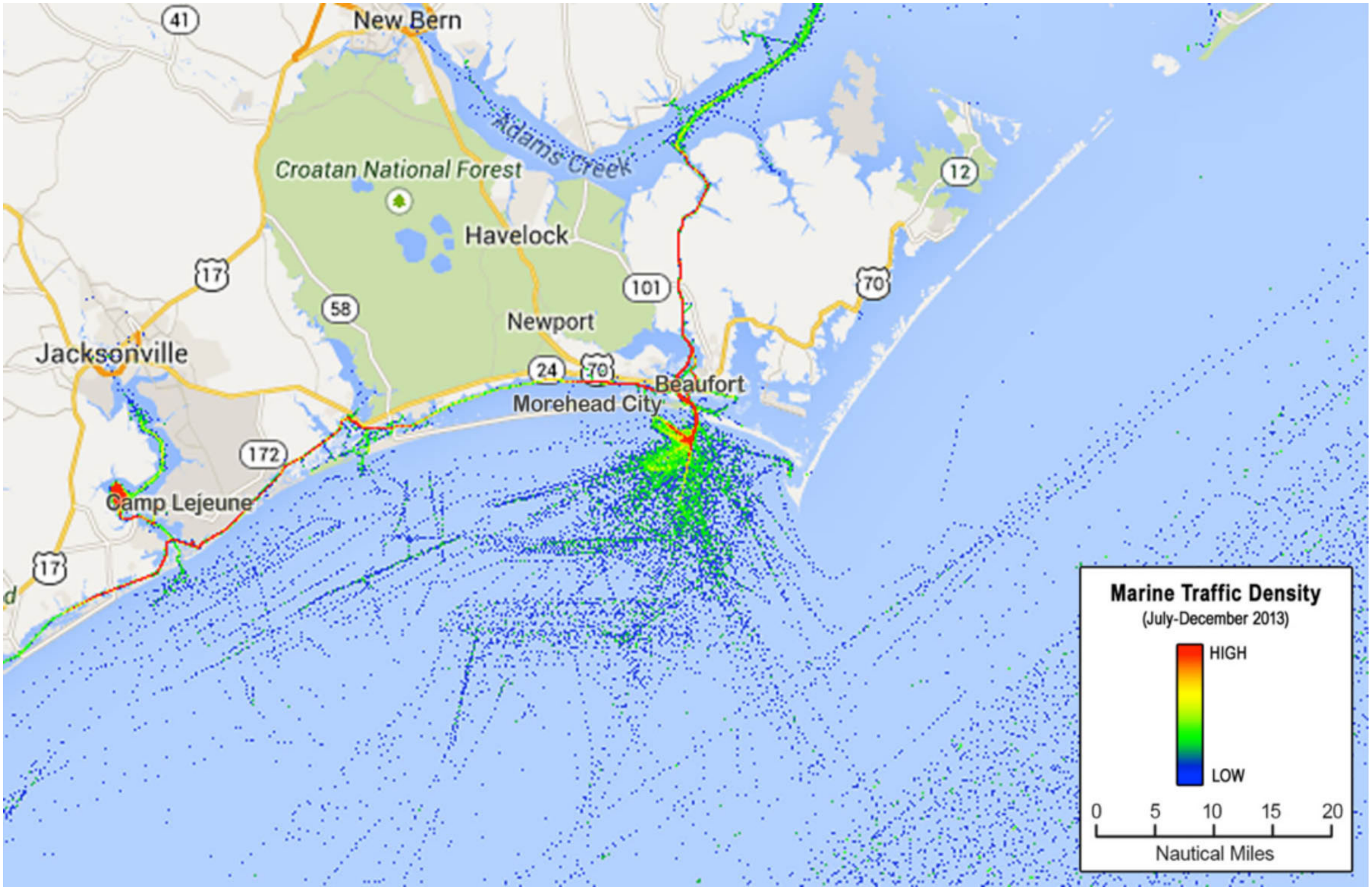


Figure 4-12 Morehead City Vessel Density

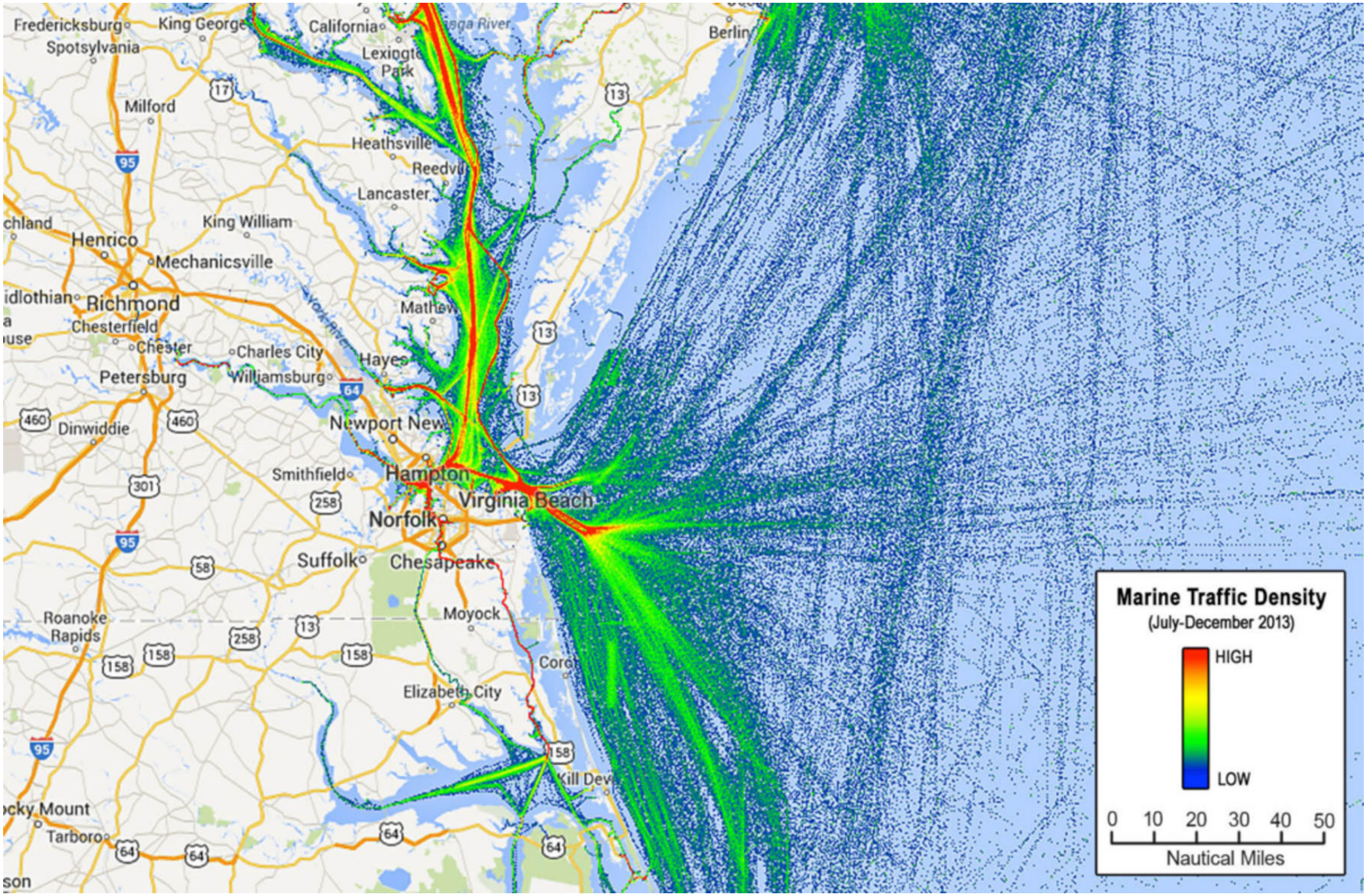


Figure 4-13 Norfolk Vessel Density

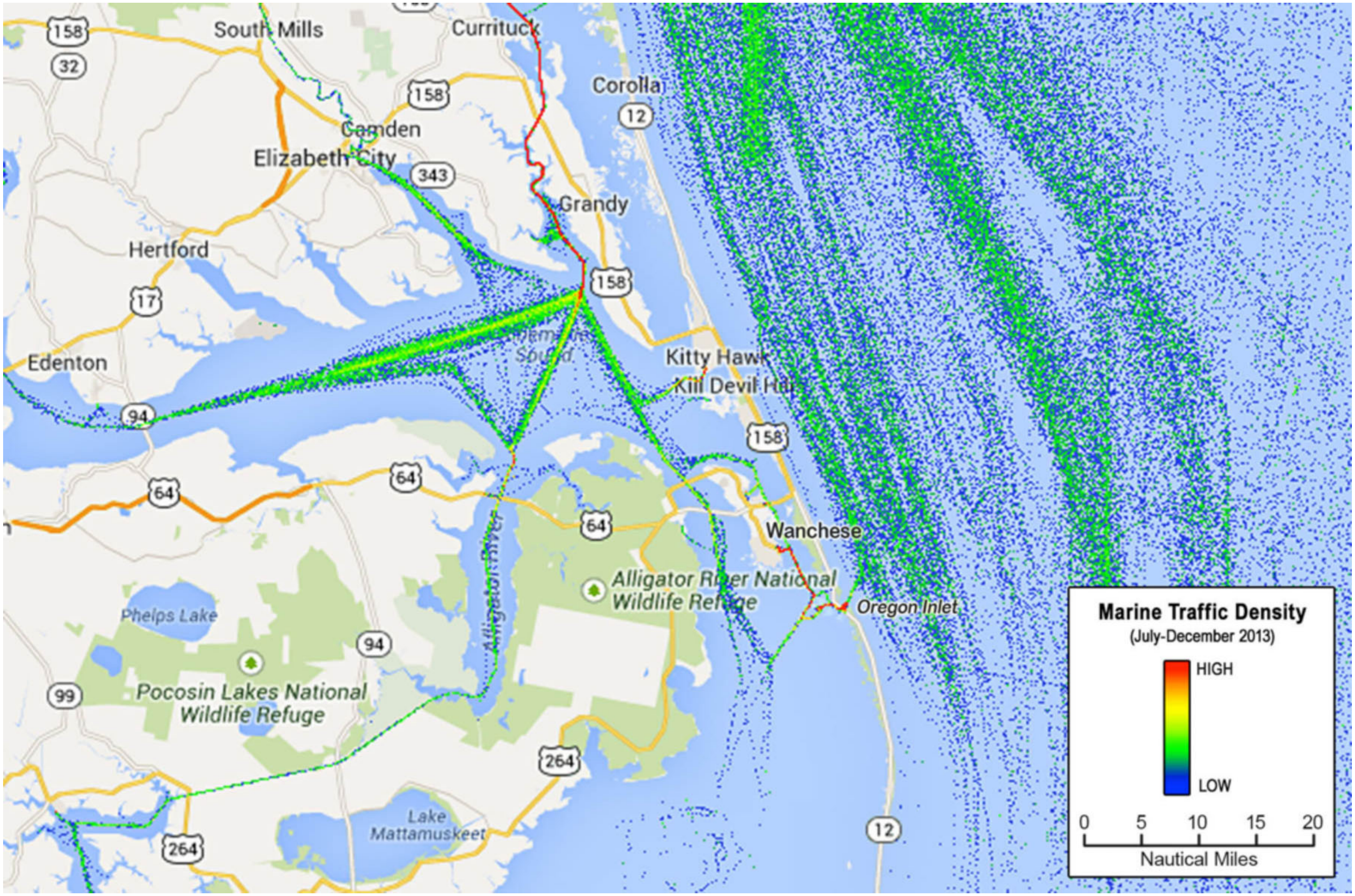


Figure 4-14 Wanchese Vessel Density

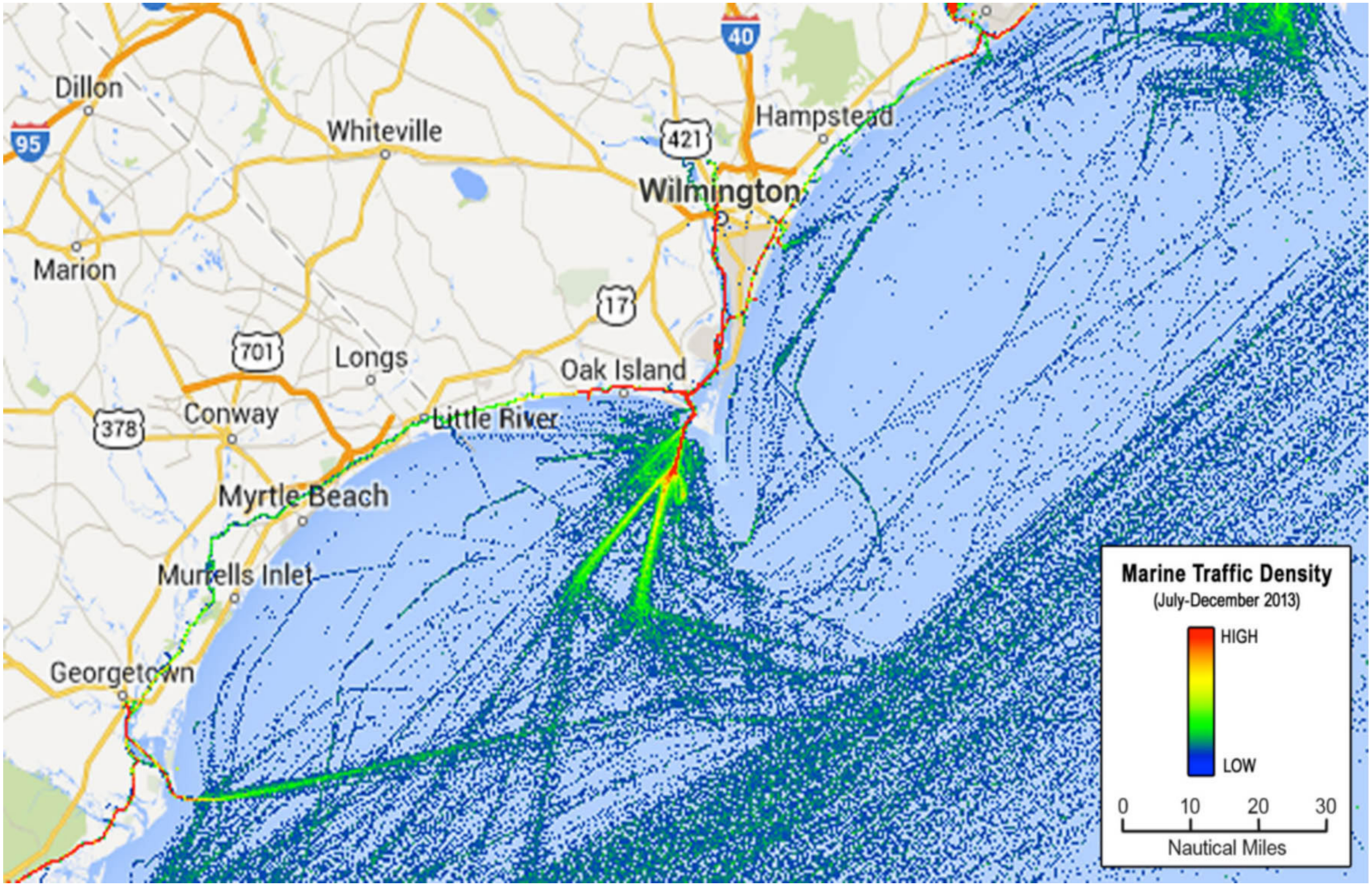


Figure 4-15 **Wilmington Vessel Density**

Table 4-10
Vessel Round Trips for Alternative A

WEA	OCS Blocks	HRG Surveys	Cable Surveys	Geotechnical Sampling Surveys	Avian Surveys	Fish Surveys	Meteorological Buoys	Meteorological Towers
Kitty Hawk	21.5	236	1	467	72–108	N/A	6–12	120
Wilmington East	25	275	1	213	24–36	N/A	120–360	60–780
Wilmington West	9	99	1	524	72–108	N/A	6–12	120
Total	**55.5**	**610**	**3**	**1204**	**171–252**	**60**	**132–384**	**300–1,020**

Table 4-11
Estimated Vessel Trips over a 5-Year Period – Alternative A

WEA	Area (acres)	Expected Number of Meteorological Towers	Expected Number of Meteorological Buoys	Survey Vessel Round Trips	Meteorological Tower Installation Vessel Round Trips
Kitty Hawk	122,405	1	2	776–812	776–812
Wilmington East	133,590	1	2	513–525	513–525
Wilmington West	51,595	1	2	696–732	696–732

Although the WEAs are not within designated routing measures, meteorological towers/buoys may still pose an obstruction to navigation. However, any placement of meteorological towers/buoys would be mitigated by USCG-required marking and lighting and avoidance of heavily traveled areas within the WEAs. Meteorological towers/buoys would also be considered Private Aids to Navigation, which are regulated by USCG under 33 CFR 66. A Private Aid to Navigation is a buoy, light, or day beacon owned and maintained by any individual or organization other than USCG. These aids are designed to allow individuals or organizations to mark privately owned marine obstructions or other similar hazards to navigation. Therefore, through the use of these aids, impacts on navigation from the placement of meteorological towers and buoys are expected to be minor.

Non-Routine Events

The AIS data in Figures 4-11 through 4-15 indicate that the majority of large commercial vessels, including cargo vessels, container vessels, and oil tankers, operate within and near the TSS lanes and follow distinct patterns to approach/depart these lanes. The WEAs were designed to avoid the major shipping lanes and the heavier traveled approach/departure areas associated with those lanes. When BOEM considers an individual SAP, it will further consider vessel traffic patterns to make sure the tower/buoy placement would reduce the already small likelihood of vessel collision or allision with structures. In addition, a fuel/oil spill resulting from a collision or allision between a vessel/tanker and a meteorological tower/buoy is not reasonably foreseeable as a result of the proposed action because of the strong likelihood that a meteorological tower/buoy would collapse or become destroyed without serious damage to an oil tanker.

According to USDOT MARAD (2013), in 2011, 98% of the oil and gas tanker calls in the United States were by double-hulled vessels, which are much less likely to release oil from collision and/or allision than single-hulled tankers. This is an increase from 83.7% in 2006. In addition, the vessel traffic associated with site characterization surveys and the construction, operation, and decommissioning of meteorological towers/buoys in proximity to the major shipping lanes and ports would not substantially increase the probability of vessel collisions and/or allisions. However, vessels servicing or decommissioning towers/buoys could collide with a tower, buoy, or other vessels. The water quality effects of non-routine events such as allisions/collisions and spills are described in Sections 3.3.2 and 3.3.3, respectively.

Conclusion

Impacts on vessel traffic and navigation as a result of site characterization surveys and the construction, operation, and decommissioning of meteorological and oceanographic data collection towers and buoys associated with Alternative A would be negligible and minor. Because the additional vessel activity associated with the proposed action is expected to be relatively small, the number of vessels passing through the WEAs is not expected to significantly increase vessel traffic density when compared to existing and projected future vessel traffic in the WEAs. Based on the use of navigation aids, impacts on navigation from the placement of meteorological towers and buoys are expected to be **minor**. In addition, because the WEAs were designed to avoid the major shipping lanes, the risk of allisions with structures causing oil spills is low; in the event of an allision, a meteorological tower/buoy would most likely collapse or become destroyed without serious damage to an oil tanker.

The potential impacts on navigation and vessel traffic that could occur as a result of the proposed action were previously analyzed in the G&G Final PEIS (BOEM, 2014a) and are hereby incorporated by reference.

In summary, the G&G Final PEIS (BOEM, 2014a) concluded that:

- Impacts on large ports from vessel traffic are expected to be negligible.
- Impacts on smaller ports are expected to range from negligible to minor and should be evaluated on a project-specific basis.
- Impacts on navigation and vessel traffic due to a small diesel spill would be negligible because it would only prohibit full use of a small area by other marine users for a very limited amount of time.

As stated in the G&G Final PEIS (BOEM, 2014a), vessel traffic associated with G&G activities would increase in specific areas, thereby increasing the potential for interference with other marine uses such as shipping and marine transportation, military range complexes and civilian space program use, sand and gravel mining, ocean dredged material disposal sites, communication and research activities from bottom-founded structures, and known sea bottom obstructions. Renewable energy and marine mineral surveys typically involve only a single survey vessel, and vessel traffic would not be significantly increased when compared to existing vessel traffic in near-shore or offshore waters. Survey vessels related to renewable energy or marine mineral activities would be relatively small and are expected to make daily round trips to their shore bases. The renewable energy scenario would require 4,255 vessel round trips for HRG surveys and 3,106 to 9,969 vessel round trips for geotechnical surveys over the 9-year timeframe analyzed in the G&G Final PEIS (BOEM, 2014a).

If smaller ports are used for the smaller vessels (approximately 66 feet [20 meters]) deployed for the types of surveys required for the renewable energy and marine mineral programs, there could be limited effects on port capacity, navigation into the port, and the potential for accidents from the increased vessel traffic.

4.4.4 Socioeconomic Resources

4.4.4.1 Cultural, Historical, and Archaeological Resources

Description of the Affected Environment

Historic properties are defined as any pre-contact or historic districts, sites, buildings, structures, or objects included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Historic properties that could experience impacts from site characterization (i.e., HRG surveys and geotechnical sampling) and/or site assessment activities (i.e., installation of meteorological towers and/or buoys) include:

- Offshore historic properties on or below the seafloor within portions of the WEAs or cable routes to shore that could be affected by seafloor disturbing activities, and

- Onshore historic properties within the viewshed of survey activities, construction activities, or installed meteorological towers and/or buoys.

The information presented in this section is based on existing and available information, and is not intended to be a complete inventory of historic properties within the affected environment. The WEAs have not been extensively surveyed and that is the reason, in part, that BOEM requires the results of historic property identification surveys to be submitted with a SAP and COP.

Offshore Historic Properties

The types of historic properties expected within the offshore affected environment include submerged pre-contact and historic period archaeological sites. An overview of the nature and scope of submerged archaeological sites on the Atlantic OCS that could be affected by site characterization and site assessment activities is presented in *A Summary and Analysis of Cultural Resource Information on the Continental Shelf from the Bay of Fundy to Cape Hatteras* (BOEM, 1981), *A Cultural Resource Survey of the Continental Shelf from Cape Hatteras to Key West* (BOEM, 1979), Section 4.2.19 of the PEIS (MMS, 2007a), and *Inventory and Analysis of Archaeological Site Occurrence on the Atlantic Outer Continental Shelf* (TRC, 2012).

Pre-contact Archaeological Sites

The WEAs offshore North Carolina are geographically located within portions of the OCS once exposed as dry land and are designated as having a high potential for the presence of submerged pre-contact archaeological sites (TRC, 2012:106). Archaeologists categorize human occupation in the eastern United States into three broad temporal periods: Paleo-Indian (13,000 or earlier to 10,000 before present [B.P.]), Archaic (10,000 to 3000 B.P.), and Woodland (3000 B.P. to the arrival of Europeans in North America). Each temporal division is distinguished by the climate, technology, and subsistence patterns characteristic of the period.

Approximately 20,000 B.P., during the peak of the last ice age known as the Last Glacial Maximum, sea level was 120 meters below present level, leaving all of the WEAs accessible to Paleo-Indian populations (TRC, 2012:97). The adaptive subsistence of humans during this period is generally associated with specialized hunting of large game and gathering of wild plants by semi-nomadic groups during a time of climatic and environmental change brought about by glacial retreat (Willey, 1966:37-38). Sudden rapid rises in sea level, known as Melt Water Pulses, occurred during the Paleo-Indian period and may have been caused in part by collapsing ice sheets and the associated release of immense quantities of melt water as ice dams associated with glacial lakes collapsed (Blanchon and Shaw, 1995; Shaw, 2002). By 10,000 B.P. sea level on the OCS offshore North Carolina was at approximately 30 meters below present level (TRC, 2012:97).

During the Archaic period, sea level rise slowed considerably and the WEAs were still likely exposed as areas of dry land. The Archaic period was marked by a change in climate following the Last Glacial Maximum that produced a more favorable environment for human subsistence. During the Archaic period, a wider range of habitats were utilized for subsistence, and thus likely a wider range of plants and animals were exploited including nuts, large and small game, seed-bearing plants, and fish (TRC, 2012:34). By the Woodland period, sea level rise had inundated the OCS to near its present level. During this time period the WEAs would have been fully submerged, removing any possibility for the presence of submerged archaeological sites within the WEAs dating to the Woodland period (TRC, 2012:8).

Not all of the formerly exposed areas within the WEAs may have survived the destructive effects of erosion caused by sea level rise and marine transgression; however, submerged landforms that are considered to have a higher probability for the potential presence and preservation of archaeological sites have been previously documented within and adjacent to two of the WEAs (TRC, 2012:99). Relict sub-bottom lagoonal and channel features have been identified west of the Kitty Hawk WEA, and portions of these features may extend into the WEA. These include lagoonal complexes associated with Platt Shoal and paleochannels identified off Duck, Kitty Hawk, and Nags Head (Moir, 1979; Browder and McNinch, 2006 [in TRC, 2012:104]). In the vicinity of Cape Fear, relict channels of the Cape Fear River extend out onto the OCS in Long Bay (TRC, 2012:104). Those sub-bottom features have been documented in the vicinity of the northeastern corner of the Wilmington West WEA.

Historic Period Archaeological Sites

The coast of North Carolina has a well-deserved reputation as the “graveyard of the Atlantic.” More than 4,000 vessel losses have been historically documented in the underwater archaeological site files of the North Carolina Department of Cultural Resources, Underwater Archaeology Unit (Morris pers. comm.). The Department of Cultural Resources functions as the State Historic Preservation Office (SHPO). High concentrations of reported shipwrecks on the North Carolina OCS are also identified in BOEM’s Atlantic Shipwreck Database (TRC, 2012:155). Documented patterns of maritime activity indicate that all areas of North Carolina’s Atlantic coastline and OCS have a high potential for containing the remains of historic period archaeological sites (TRC, 2012:218).

Shipwrecks along the North Carolina coast and within the WEAs have the potential to date from as early as the late sixteenth century and likely include vessels from every subsequent century. The earliest vessel losses in the region may well be associated with undocumented vessels of Spanish explorers or the fleet of Sir Francis Drake and Sir Walter Raleigh’s efforts to establish a colony at Roanoke Island in the 1580s. As English colonies in North America developed, so did the loss of merchant vessels and warships. During the American Revolution, the Quasi-War with France, the War of 1812, the American War Between the States, World War I, and World War II, there was a corresponding increase in the numbers of vessels lost or destroyed at sea offshore North Carolina (TRC, 2012:207).

The Kitty Hawk WEA and the adjacent northern Outer Banks are in the vicinity of one of the most heavily traveled navigation routes on the Atlantic seaboard. Reported shipwrecks in the Atlantic Shipwreck Database include 16 possible sites within and surrounding the Kitty Hawk WEA. The Cape Fear entrances to the Port of Wilmington, in the vicinity of the Wilmington East and West WEAs, have one of the highest associated concentrations of reported shipwrecks in

North Carolina. Seven shipwrecks are reported in the Atlantic Shipwreck Database within and surrounding the Wilmington East WEA. Recent reconnaissance-level geophysical survey conducted as part of a BOEM-funded seafloor mapping study identified five shipwrecks within the Wilmington West WEA (BOEM, 2015d). In the absence of complete high-resolution survey data for all of the North Carolina WEAs, the presence and location of shipwrecks cannot be predicted with any degree of reliability because of human inconsistency, environmental factors, and the dearth of historical data. Ample evidence exists, however, to support the determination that all of the WEAs have a high probability for the presence of historic period archaeological sites.

Onshore Historic Properties

The types of historic properties expected within the onshore affected environment include districts, sites, buildings, structures, or objects within the viewshed of site characterization and site assessment activities. An overview of the nature and scope of onshore historic properties that could be affected by site characterization and site assessment activities is presented in *Evaluation of visual impact on cultural resources/historic properties: North Atlantic, MidAtlantic, South Atlantic, and Florida Straits* (Klein et al., 2012) and *Visual Assessment: Bureau of Ocean Energy Management (BOEM): Commercial Wind Leasing and Site Assessment Activities on the Atlantic Outer Continental Shelf (OCS) Offshore North Carolina* (Appendix F). Discussion of visual resources is also provided in this document (see Section 4.4.4.6).

Klein et al. (2012) have documented 48 known NRHP-listed and potentially eligible properties within Dare and Currituck counties adjacent to the Kitty Hawk WEA. These include such properties as the Bodie Island Light Station, Wright Brothers Memorial, Wright Brothers National Memorial Visitor Center, and the Cape Hatteras Light Station. Klein et al. (2012) have documented 42 known NRHP-listed and potentially eligible properties within Brunswick County adjacent to the Wilmington East and West WEAs. These include such properties as the Baldhead Island Lighthouse and the Oak Island Lighthouse.

Impact Analysis of Alternative A

The potential impacts on historic properties that could occur as a result of the proposed action were previously analyzed in the 2014 Final G&G Final PEIS (BOEM, 2014a) and are hereby incorporated by reference.

In summary, the G&G Final PEIS (BOEM, 2014a) concluded that:

- Impacts on cultural, historical, and archaeological resources from seafloor disturbance activities (i.e., bottom sampling [cores and grabs]; placement of anchors, nodes, cables, or other bottom-founded equipment; and placement of anchored monitoring buoys) are expected to be **negligible**.
- Impacts on cultural, historical, and archaeological resources from accidental fuel spills are expected to be **negligible**.

Routine Activities

Site Characterization Activities

Site characterization activities include both HRG surveys (e.g., shallow hazard, geological, archaeological, and biological surveys) and geotechnical and sediment sampling techniques (e.g., vibracores, CPTs, deep borings). Geophysical surveys do not affect the bottom and, therefore, have no ability to affect historic properties.

Geotechnical and sediment sampling techniques do affect the seafloor; therefore, these activities have the ability to affect offshore historic properties through physical destruction or damage to all or part of the property. However, if the lessee conducts HRG surveys (which serve, in part, to identify offshore historic properties) prior to conducting geotechnical/sediment sampling, the lessee may avoid impacts on offshore historic properties by relocating the sampling activities away from potential historic properties. Therefore, BOEM would require a lessee to conduct HRG surveys consistent with the *Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585* prior to conducting geotechnical/sediment sampling, and, when a potential offshore historic property is identified, the lessee would be required to avoid it. Inclusion of the following elements in the lease(s) will ensure avoidance of offshore historic properties. Language including the following elements would be included in commercial leases issued within the North Carolina WEAs:

- The lessee may only conduct geotechnical exploration activities, including geotechnical sampling or other direct sampling or investigation techniques, which are performed in support of plan (i.e., SAP and/or COP) submittal, in areas of the leasehold in which an archaeological analysis of the results of geophysical surveys has been completed for that area.

- The analysis must be completed by a qualified marine archaeologist who both meets the Secretary of the Interior's Professional Qualifications Standards (48 FR 44738–44739) and has experience analyzing marine geophysical data.

- This analysis must include a determination of whether any potential archaeological resources are present in the area, and the geotechnical (sub-bottom) sampling activities must avoid potential archaeological resources by a minimum of 164.0 feet (50.0 meters). The avoidance distance must be calculated from the maximum discernible extent of the archaeological resource.

- A Qualified Marine Archaeologist must certify in the lessee's archaeological reports included with a SAP or COP that geotechnical exploration activities did not affect potential historic properties identified as a result of the HRG surveys.

- In no case may the lessee's actions affect a potential archaeological resource without BOEM's prior approval.

Additionally, during all ground-disturbing activities, including geotechnical exploration, BOEM will require that the lessee observe the unanticipated finds requirements stipulated in 30

CFR 585.802. Language including the following elements would be included in commercial leases issued within the North Carolina WEAs:

- If the lessee, while conducting site characterization activities in support of plan (i.e., SAP and/or COP) submittal, discovers a potential archaeological resource such as the presence of a shipwreck (e.g., a sonar image or visual confirmation of an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of historic objects, piles of ballast rock), prehistoric artifacts, and/or relict landforms, within the project area, the lessee must:
  - Immediately halt seafloor/bottom-disturbing activities within the area of discovery;
  - Notify the lessor within 24 hours of discovery;
  - Notify the lessor in writing by report within 72 hours of its discovery;
  - Keep the location of the discovery confidential and take no action that may adversely affect the archaeological resource until the lessor has made an evaluation and instructs the applicant on how to proceed; and
  - Conduct any additional investigations as directed by the lessor to determine if the resource is eligible for listing in the NRHP (30 CFR 585.802(b)). The lessor will direct the lessee to conduct such investigations if: (1) the site has been affected by the lessee's project activities; or (2) impacts on the site or on the area of potential effect cannot be avoided. If investigations indicate that the resource is potentially eligible for listing in the NRHP, the lessor will tell the lessee how to protect the resource or how to mitigate adverse effects on the site. If the lessor incurs costs in protecting the resource, under Section 110(g) of the National Historic Preservation Act (NHPA), the lessor may charge the lessee reasonable costs for carrying out preservation responsibilities under the OCS Lands Act (30 CFR 585.802(c-d)).

Finally, onshore historic properties could at times be within the viewshed of vessel traffic associated with HRG survey activities. These activities could introduce visual elements that diminish the characteristics of the property that contribute to its eligibility for listing in the NRHP. However, the increased ocean vessel traffic from these survey activities would be indistinguishable from existing ocean vessel traffic, and these impacts would be temporary and minimal. Therefore, impacts from site characterization activities on both offshore and onshore historic properties are expected to be **negligible**.

Site Assessment Activities

For site assessment activities, this EA considers the impacts of construction and operation of up to one meteorological tower and/or two meteorological buoys per each of the North Carolina WEAs. Although the construction of meteorological towers and buoys affects the seafloor, the lessee's SAP must be submitted to and approved by BOEM prior to construction. To assist BOEM in complying with the NHPA (see Section 5.3.4 of this EA) and other relevant laws (30 CFR 585.611(a), (b)(6)), the SAP must contain a description of the historic properties that could be affected by the activities proposed in the plan. Under its Programmatic Agreement (see Appendix E of this EA), BOEM will consult with the SHPO prior to the approval of a SAP to ensure potential effects on historic properties are avoided, minimized, or mitigated under Section 106 of the NHPA.

The impacts associated with the installation of meteorological towers and buoys would occur from disturbance of the seafloor caused by foundation installation, anchoring of support vessels, use of jack-up barges, installation of scour control systems, placement of mooring anchors, and anchor chain drag. Impacts on offshore archaeological resources within these areas of disturbance could result in direct destruction of all or part of the property and also removal of archaeological materials from their primary context. Although this would be unlikely given that site characterization surveys (including archaeological surveys) described above would be conducted prior to the installation of any structure (see e.g., 30 CFR 585.610 and 585.611), should contact between the activities associated with Alternative A and a historic or pre-contact archaeological site occur, there may be damage to or loss of archaeological resources.

Should the archaeological surveys reveal the possible presence of an archaeological site in an area that may be affected by activities proposed in a SAP, BOEM would likely require the applicant to avoid the potential site or to demonstrate through additional investigations that an archaeological resource either does not exist or would not be adversely affected by the seafloor/bottom-disturbing activities. If avoidance of the historic property is not possible, BOEM will continue Section 106 consultation under the Programmatic Agreement to resolve adverse effects. Although site assessment activities have the potential to affect cultural resources either on or below the seabed, existing regulatory measures, coupled with the information generated for a lessee's initial site characterization activities and presented in the lessee's SAP, make the potential for bottom-disturbing activities to damage historic properties low. Therefore, impacts on offshore historic properties from site assessment activities are expected to be **negligible**.

Because of the distance of each WEA from shore, it is anticipated that meteorological buoys will not be visible from coastal areas and would have no impact on onshore historic or heritage properties. Meteorological towers may be visible from shore. Onshore historic properties could be within the viewshed of meteorological towers, which have the potential to introduce visual elements that diminish the characteristics of the property that contribute to its eligibility for listing in the NRHP. However, as discussed in Section 4.4.4.6 and illustrated in Appendix F and in the time-lapse video taken from Sunset Beach Pier nearest to the Wilmington West WEA (available at: http://www.boem.gov/state-activities-north-carolina/), the visibility of meteorological towers within the WEAs is anticipated to be minimal, even on clear days, and not substantially different whether viewed from the shoreline or elevated vantage points, such as lighthouses. In addition, existing ports and other onshore infrastructure are capable of supporting site assessment activities with no expansion. Therefore, impacts from site assessment activities on onshore historic properties are expected to be **negligible**.

Conclusion

Increased ocean vessel traffic from survey activities would be indistinguishable from existing ocean vessel traffic, would be temporary, and would not diminish any characteristics they may have that would make them eligible for the NRHP. Therefore, impacts on both offshore and onshore historic properties from site characterization activities are expected to be **negligible**. Installation of meteorological towers and buoys would result in disturbance of the seafloor and could affect offshore archaeological resources within these areas of disturbance These effects would be unlikely because archaeological surveys conducted during site characterization described above would be conducted prior to the installation of any structure. If archaeological resources are discovered during the site characterization surveys, additional investigations and avoidance of the resource would occur. If avoidance is not feasible, BOEM will continue its Section 106 consultation to resolve adverse effects. Therefore, effects on archaeological resources from site characterization activities would be **negligible**. Based on the visual simulations, meteorological towers would be only minimally visible on clear days and would not be expected to affect the viewshed. Therefore, effects on onshore historic properties and heritage resources would be **negligible**.

4.4.4.2 Demographics and Employment

Description of the Affected Environment

The affected environment for the analysis of potential demographic and employment impacts of the action alternatives are the communities with ports that may be used by lessees. Although specific ports would be determined in the future by lessees and further analyzed in project-specific NEPA analyses, BOEM expects ports may include the Ports of Virginia, VA, Wilmington, NC, and Charleston, SC, as well as the smaller ports of Wanchese, NC, Hatteras Harbor Marina, NC, Port of Morehead City, NC, Southport Marina, NC, and Port of Georgetown, SC

Characteristics of the Ports of Virginia, Wilmington, and Charleston are described in the G&G Final PEIS (BOEM, 2014a) and incorporated here by reference. These are ports located in metropolitan statistical areas with populations between 362,000 (Wilmington) and 1,672,000 (Virginia Beach-Norfolk-Newport News) and a labor force of at least 172,000 (Wilmington) (BOEM, 2014a).

The Ports of Wanchese, NC, Hatteras Harbor Marina, NC, Port of Morehead City, NC, Southport Marina, NC, and Georgetown, SC, are all within Metropolitan or Micropolitan Statistical Areas. These areas include territory with a high degree of social and economic integration with a core urban area as measured by commuting ties. Metropolitan Statistical Areas have an urban cluster with a population over 50,000, and Micropolitan Statistical Areas have an urban cluster with a population between 10,000 and less than 50,000. The population and labor force in the Metropolitan and Micropolitan Statistical Areas around each of these ports are shown in Tables 4-12 and 4-13, respectively.

Ocean-related activities employed 118,657 people in Virginia in 2011, 65,027 in South Carolina, and 39,808 in North Carolina (NOEP, 2014). This represents 3.0% of total civilian employment in Virginia in that year, 3.4% in South Carolina, and 1.0% in North Carolina (U.S. Bureau of Labor Statistics, 2011). Between 2005 and 2011, employment in ocean-related activities grew 0.2% per year in Virginia and 1.2% per year in South Carolina, and decreased 0.3% per year in North Carolina (NOEP, 2014).

Table 4-12
Population

Port	Metropolitan or Micropolitan Statistical Area	Counties	Population 2000	Population 2010	Growth
Wanchese, NC Hatteras Harbor Marina, NC	Kill Devil Hills, NC, Micropolitan Statistical Area	Dare County, Tyrrell County	34,116	38,327	12.3%
Port of Morehead City, NC	Morehead City, NC, Micropolitan Statistical Area	Carteret County	59,383	66,469	11.90%
Southport Marina, NC	Myrtle Beach-Conway-North Myrtle Beach, SC-NC, Metropolitan Statistical Area	Brunswick County, NC, Horry County – SC	269,772	376,722	39.60%
Port of Georgetown, SC	Georgetown, SC, Micropolitan Statistical Area	Georgetown County	55,797	60,158	7.8%
Source: U.S. Census Bureau, 2013					

Table 4-13
Labor Force and Unemployment, Average of Year 2013[1]

Port	Metropolitan or Micropolitan Statistical Area	Labor Force (thousands)	Unemployment Rate	Unemployed (thousands)
Wanchese, NC	Kill Devil Hills, NC, Micropolitan Statistical Area	25.2	9.7%	2.4
Hatteras Harbor Marina, NC				
Port of Morehead City, NC	Morehead City, NC, Micropolitan Statistical Area	32.4	7.4%	2.4
Southport Marina, NC	Myrtle Beach-Conway-North Myrtle Beach, SC-NC, Metropolitan Statistical Area[1]	136.0	7.6%	10.4
Port of Georgetown, SC	Georgetown, SC, Micropolitan Statistical Area	29.0	8.2%	2.4

Source: U.S. Bureau of Labor Statistics, 2013

[1] For Myrtle Beach-Conway-North Myrtle Beach, SC-NC, Metropolitan Statistical Area August of 2013.

Impact Analysis of Alternative A

Routine Activities

The potential impacts on demographics and employment that could occur as a result of the site characterization surveys were previously analyzed in the G&G Final PEIS (BOEM, 2014a) In summary, the G&G Final PEIS (BOEM, 2014a) concluded that impacts from site characterization surveys are expected to be **negligible**.

The G&G Final PEIS (BOEM, 2014a) found that, based on projected levels of survey activity, the small number of workers directly employed in site characterization surveys would be insufficient to have a perceptible impact on local employment and population. Additional impacts on employment and population in and around ports would derive from site assessment activities not analyzed in the G&G Final PEIS (BOEM, 2014a). BOEM expects site assessment activities to be based mostly at the larger ports of Virginia, Wilmington, and Charleston because of the requirements for fabrication of meteorological towers (Chapter 3). Appendix C shows a total of up to 945 vessel round trips, over a period of 5 years, to the Kitty Hawk WEA; 1,665 to the Wilmington East WEA; and 864 to the Wilmington West WEA. If distributed evenly over the eight ports considered in this EA and over the 5-year period, vessel round trips would average 87 per year per port. Considering that crews for renewable energy surveys would range between 10 and 20 people (BOEM, 2012b), BOEM expects any impacts on employment and population in and around the ports to be mostly imperceptible, depending on the distribution of activities among ports and over time. Site assessment activities would also employ workers for construction, maintenance, and decommissioning of meteorological towers and buoys. BOEM expects up to three towers and six buoys to be constructed, maintained, and decommissioned over a 5-year period. Because of the small number of workers associated with these activities, there would be no perceptible added demographic and employment impacts for populations in and around the ports used as base support.

The G&G Final PEIS (BOEM, 2014a) also concluded that the demand for berthing space at ports and use of port channels by site characterization surveys would be insufficient to adversely affect the current use of ports along the Atlantic Coast. Based on the average vessel round trips per year per port estimated above (87), and on the fact that site assessment activities would be expected to mostly use the three larger ports, the same would be true for impacts related to both site characterization surveys and site assessment activities.

Non-Routine Events

The potential impacts on demographics and employment that could occur as a result of accidental fuel spills were previously analyzed in the G&G Final PEIS (BOEM, 2014a) and are hereby incorporated by reference. In summary, the G&G Final PEIS (BOEM, 2014a) concluded that impacts from an accidental fuel spill are expected to be **negligible**.

The G&G Final PEIS (BOEM, 2014a) found that the incremental use of onshore bases and port facilities associated with site characterization surveys would be small relative to current utilization, the risk of damage or harm would not increase substantively compared to the current risk at shore base locations, and any damage or harm that were to occur would be small relative to the size of local populations. Accidental fuel spills associated with site assessment activities would be in addition to those associated with site characterization surveys. Based on the use of onshore bases and port facilities for site assessment surveys described above, the added risk of damage or harm from the additional site assessment activities would also be small relative to the size of the population in and around the ports, and would be concentrated in the areas around the larger ports.

Conclusion

BOEM expects any impacts on employment and population in and around the ports to be mostly imperceptible, depending on the distribution of activities among ports and over time. Site assessment activities would employ a small number of workers for construction, maintenance, and decommissioning of meteorological towers and buoys over a 5-year period. Because of the small number of workers associated with these activities, there would be no perceptible added demographic and employment impacts for populations in and around the ports used as base support. BOEM concluded that the impacts on employment and population in and around the ports would be **negligible** to **minor.** The risk of damage or harm from the site assessment activities would also be small relative to the size of the population in and around the ports, and would be concentrated in the areas around the larger ports. Therefore, BOEM concludes that the impacts from accidental fuel spills on populations in and around the ports, considering both site characterizations surveys and site assessment activities, would be **negligible**.

4.4.4.3 Environmental Justice

Description of the Affected Environment

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations" (Subsection 1-101). If such effects are identified, appropriate mitigation measures must be implemented. The 2007 PEIS contains a complete description of the method of analysis (MMS, 2007a).

The G&G Final PEIS (BOEM, 2014a) identified the Virginia Beach-Norfolk-Newport News and the Charleston-North Charleston Metropolitan Statistical Areas as minority populations. The presence of African Americans in these Metropolitan Statistical Areas was considered meaningfully greater than in the country as a whole. None of the Metropolitan Statistical Areas were considered low-income populations in that high level analysis.

The G&G Final PEIS (BOEM, 2014a) did not analyze in detail the Kill Devil Hills, Morehead City, or Georgetown Micropolitan Statistical Areas or the Myrtle Beach-Conway-North Myrtle Beach Metropolitan Statistical Area. Demographic data are provided for these areas in Table 4-14, and poverty data are shown in Table 4-15. Of these areas, only the Georgetown Micropolitan Statistical Area can be considered a minority population, with an African American percentage presence greater than that of the state of South Carolina or the country as a whole. The Georgetown Micropolitan Statistical Area and the Myrtle Beach-Conway-North Myrtle Beach Metropolitan Statistical Area are low-income populations, with the share of individuals in poverty greater than the share in the state of South Carolina and in the country as a whole.

Table 4-14
Minority Presence, 2010

Geography	Total Population	Percentage of Total Population								
		White	Black or African American	Alaska Native or American Indian	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race Alone	Two or More Races	Hispanic or Latino[a]	Total Minority Population[b]
United States	308,745,538	72.4%	12.6%	0.9%	4.8%	0.2%	6.2%	2.9%	16.3%	36.3%
North Carolina	9,535,483	68.5%	21.5%	1.3%	2.2%	0.1%	4.3%	2.2%	8.4%	34.7%
Wilmington, NC	112,067	75.5%	19.9%	0.5%	1.2%	0.1%	2.7%	2.2%	6.1%	32.7%
Kill Devil Hills, NC, Micro Area	33,920	92.3%	2.5%	0.4%	0.6%	0.0%	2.4%	1.8%	6.5%	11.4%
Morehead City, NC, Micro Area	66,469	89.3%	6.1%	0.5%	0.9%	0.1%	1.2%	2.0%	3.4%	12.6%
South Carolina	4,625,364	66.16%	27.90%	0.42%	1.28%	0.06%	2.45%	1.73%	5.10%	35.95%
Myrtle Beach-Conway-North Myrtle Beach, SC-NC, Metro Area	269,291	79.9%	13.4%	0.5%	1.0%	0.1%	3.1%	2.0%	6.2%	22.7%
Georgetown, SC, Micro Area	60,158	63.2%	33.6%	0.2%	0.5%	0.0%	1.6%	0.9%	3.1%	38.0%

Source: U.S. Census Bureau, 2010

a Individuals who identify themselves as Hispanic, Latino, or Spanish might be of any race; the sum of the other percentages under the “Percentage of Total Population” columns plus the “Hispanic or Latino” column therefore does not equal 100%.

b The total minority population, for the purposes of this analysis, is the total population minus the non-Latino/Spanish/Hispanic population.

Table 4-15
Low-Income Presence, 2012

	Percentage of People in Poverty
United States	14.9%
North Carolina	*16.8%*
Kill Devil Hills, NC, Micro Area	10.4%
Morehead City, NC, Micro Area	14.1%
South Carolina	*17.6%*
Myrtle Beach-Conway-North Myrtle Beach, SC-NC, Metro Area	18.0%
Georgetown, SC, Micro Area	20.1%

The G&G Final PEIS (BOEM, 2014a) also considered potential environmental justice impacts on fishing communities, because these are often low-income. The G&G Final PEIS (BOEM, 2014a) concluded that fishing communities in the states of Virginia, North Carolina, and South Carolina do not generally have a minority or low-income presence greater than the country as a whole. However, individual fishing communities could be minority or low-income populations. Because identification of individual minority or low-income fishing communities would not affect the environmental justice impact analysis at the current level of analysis, no further detail on fishing communities is provided in this EA. Site-specific project environmental reviews would be expected to identify individual minority and low-income fishing communities and assess any disproportionately high human health and environmental effects that these communities would face.

The Gullah/Geechee Cultural Heritage Corridor

The Gullah/Geechee Cultural Heritage Corridor (Corridor) was designated by Congress in 2006 (Public Law 109-338) and extends from Wilmington, NC to Jacksonville, Florida. The Corridor is home to a unique culture that was first shaped by West African slaves brought to the southern United States. Their traditions continue today through their descendants, known as the Gullah Geechee people. The Corridor was established to:

- recognize the important contributions made to American culture and history by African Americans known as the Gullah/Geechee who settled in the coastal counties of South Carolina, Georgia, North Carolina, and Florida;
- assist state and local governments and public and private entities in South Carolina, Georgia, North Carolina, and Florida in interpreting the story of the Gullah/Geechee and preserving Gullah/Geechee folklore, arts, crafts, and music; and
- assist in identifying and preserving sites, historical data, artifacts, and objects associated with the Gullah/Geechee for the benefit and education of the public.

Impact Analysis of Alternative A

Routine and Non-Routine Events

No high and adverse human health or environmental effects have been identified in this EA from the alternatives analyzed. Therefore, no disproportionately high and adverse human health or environmental effects are anticipated to affect minority or low-income populations as a result of the proposed action.

Conclusion

Because no disproportionately high and adverse human health effects would occur as a result of the proposed action, there would be **no effect** on minority or low-income populations.

4.4.4.4 Recreation and Tourism

Description of the Affected Environment

Coastal recreational resources adjacent to the location of the proposed site characterization activities are described in the G&G Final PEIS (BOEM, 2014a) and incorporated here by reference. Marine-based tourism and recreation contribute to an estimated 1.8% of employment in Virginia, 0.8% of employment in North Carolina, and 3.2% of employment in South Carolina (BOEM, 2012). Popular tourist destinations are located in the proximity of the proposed WEAs, including the North Carolina Outer Banks and Myrtle Beach in South Carolina. There are also two National Seashores along the coast of North Carolina, Cape Hatteras and Cape Lookout (BOEM, 2014a).

In 2012, BOEM conducted a study to identify areas on the Atlantic seacoast most likely to experience impacts on tourism and recreational economies from offshore wind development (BOEM, 2012b). The study identified communities sensitive to impacts on tourism, based on their economies' reliance on ocean-related recreation and tourism for employment and business. Among 113 potentially sensitive communities, BOEM identified the top 70 most likely to be affected. Of these, the independent city of Virginia Beach, VA, seven counties in North Carolina (Brunswick, Carteret, Craven, Currituck, Dare, Hyde, New Hanover, Onslow, and Pender), three counties in South Carolina (Charleston, Georgetown, and Horry), and Myrtle Beach, SC, are located along the coastal area between the Ports of Charleston and Virginia (Figure 4-16) and, therefore, adjacent to the areas where site characterization surveys and site assessment activities would occur (BOEM, 2012b). In all these communities, recreational activities and tourism are a mix of land and ocean activities and attractions. Land attractions include visiting historic towns and landmarks, golfing, biking, horse watching or horseback riding, bird watching, kayaking, and beach going. Ocean activities include fishing, surfing, swimming, diving, boating, and sailing. Visitation tends to increase in the summer.

As discussed in detail in Section 1.6, during the early stages of area identification and public scoping, the original size of Call Area Kitty Hawk was reduced because of navigation safety and proximity to the historic Bodie Island Lighthouse. Distances to the shoreline were moved to a minimum of 33.7 nm from the lighthouse. For the Wilmington West Call Area, the original size was reduced and the boundary moved to a minimum distance of 10 nm from the shoreline because of visual concerns. The boundaries of the Wilmington East Call Area were also reduced because of shipping lanes and areas where fish may concentrate.

Impact Analysis of Alternative A

Routine Activities

The potential impacts on recreation and tourism that could occur as a result of site characterization surveys were previously analyzed in the G&G Final PEIS (BOEM, 2014a) and are hereby incorporated by reference. The G&G Final PEIS (BOEM, 2014a) considered that the main impact-producing factor associated with site characterization surveys would be the generation of trash and debris. Compliance with federal regulations and the relative amount of added vessel traffic compared to existing vessel traffic would reduce accidental generation of trash and debris to a minimum. BOEM concluded that the impacts would be negligible.

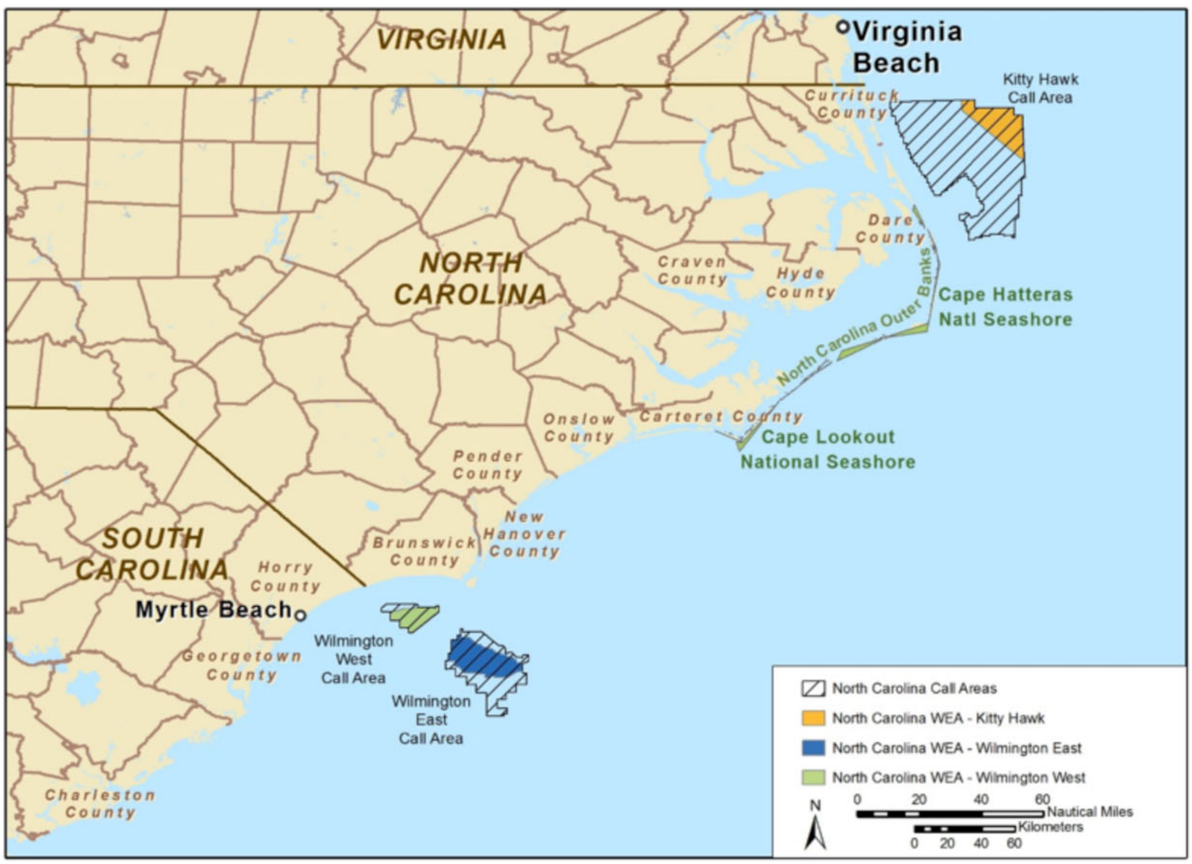


Figure 4-16 Recreational Areas within the Vicinity of WEAs

Site assessment activities would add vessel traffic to that analyzed in the G&G Final PEIS (BOEM, 2014a). However, the total vessel traffic associated with site characterization surveys and site assessment activities would remain small, averaging a total of 87 round trips per port per year (see Section 4.4.4.2, *Demographics and Employment*).

In response to stakeholder concerns, WEA boundaries were moved farther offshore and away from areas with high value to recreation and tourism. Cape Hatteras National Seashore is in the process of seeking a Night Sky Designation from the International Dark Sky Association. Any residual ambient lighting associated with meteorological towers, as well as future wind energy development, could potentially affect the naturally dark skies over the park that is highly valued by park visitors and other tourists visiting the Outer Banks. Meteorological towers would be placed at least 10 nm from shore and a minimum of 30 nm from the Cape Hatteras National Seashore. Because of the distance from shore, placement of meteorological towers and buoys is not anticipated to affect the viewshed from onshore recreational and tourist sites (e.g., Bodie Island Lighthouse and coastal areas near the Wilmington West WEA). Therefore, effects on tourism and recreation as a result of meteorological tower and buoy placement are expected to be **negligible** to **minor.** Detailed analysis of visual effects is located in Section 4.4.4.6.

Non-Routine Events

The potential impacts on recreation and tourism that could occur as a result of accidental fuel spills were previously analyzed in the G&G Final PEIS (BOEM, 2014a) and are hereby incorporated by reference. Diesel spills are expected to disperse rapidly and the impacts on recreational resources were expected to be **negligible** to **minor**, depending on the location of the spill. Site assessment activities would add a small increase in vessel traffic to that analyzed in the G&G Final PEIS (BOEM, 2014a).

Conclusion

Total vessel traffic associated with site characterization surveys and site assessment activities would be relatively small and, therefore, potential impacts from accidental fuel spills would be **negligible** to **minor**. The WEAs were designed to minimize effects on the viewshed and primary recreational resources; therefore, effects on tourism and recreation as a result of meteorological tower and buoy placement are expected to be **negligible** to **minor**.

4.4.4.5 Commercial and Recreational Fisheries

Description of the Affected Environment

The G&G Final PEIS (BOEM, 2014a) includes a description of the affected environment for commercial and recreational fisheries and is hereby incorporated by reference into this EA.

Employment in commercial fisheries in North Carolina is relatively low compared to other states: employment in commercial fisheries is approximately 0.15% of the employment level in commercial fisheries nationwide. Fishing communities in North Carolina tend to be small rural ports. The majority of landings occur inside the Outer Banks and barrier islands (Kirkpatrick et al., 2014). Important commercial species in North Carolina include white shrimp, southern flounder, summer flounder, brown shrimp, Atlantic croaker, and quahog clam. In 2012, commercial fishing landings in North Carolina totaled approximately $80 million, 72% of which originated in areas 0 to 3 miles from the shore and 28% in areas 3 to 200 miles from the shore. This contrasts with neighboring states, where the share of fishing landings from areas beyond 3 miles from the shore is larger (71% of total commercial fishing landings by value in Virginia, 67% in South Carolina) (BOEM, 2014a).

Among the ports BOEM expects to be used by the proposed project, the port of Wanchese is an important fishing community (BOEM, 2015c). In 2012, the Port of Wanchese-Stumpy Point ranked 47th among U.S. ports in quantity of commercial fishing landings, although it did not rank in the top 50 in dollar value of commercial fishing landings (NMFS, 2012). As part of the early identification of the WEAs during the public scoping process, the boundaries of the Wilmington East WEA were reduced to avoid areas where fish may concentrate.

North Carolina ranked fifth nationally for expenditures related to recreational fishing (BOEM, 2014a). In 2013, the number of angler trips (a measure of recreational fishing effort) in North Carolina was third among U.S. states, behind only Florida and California. Approximately 53% of trips were ocean trips within 3 miles of the shore, 5% were ocean trips beyond 3 miles of the shore, and 42% were inland trips (NMFS, 2013b).

Impact Analysis of Alternative A

As disclosed in the G&G Final PEIS (BOEM, 2014a), site characterization surveys associated with renewable energy have the potential to affect commercial and recreational fisheries through active acoustic sound sources, vessel traffic, seafloor disturbance, trash and debris, and accidental fuel spills. There would be an increased potential for a localized and temporary decrease in catchability of one or more commercial fish species. Overall, impacts associated with active acoustic sound generated from G&G activities are not expected to adversely affect aggregate commercial fishery landings. Impacts on commercial fisheries from active acoustic sound sources would be **minor** (BOEM, 2014a). A detailed discussion of the potential impacts on fisheries is available in the G&G Final PEIS (BOEM, 2014a). The conclusions of the G&G Final PEIS (BOEM, 2014a) are incorporated by reference into this EA. In summary, the G&G Final PEIS (BOEM, 2014a) analysis of impacts on fisheries from G&G activities associated with renewable energy surveys concluded:

- Impacts from active acoustic sound sources specific to HRG surveys for renewable energy would use “soft start” methods and are expected to be **negligible** for commercial fisheries and **negligible** to **minor** for recreational fisheries.
- Impacts from vessel traffic are expected to be **negligible** for commercial fisheries and **negligible** to **minor** for recreational fisheries.
- Impacts from seafloor disturbance are expected to be **negligible** for commercial fisheries (depending on location), and no impacts on recreational fisheries were identified.
- Impacts from accidental fuel spills are expected to be **negligible** to **minor** for commercial fisheries and recreational fisheries.

Routine Activities

Site assessment activities would add noise from installation of piles to support meteorological towers. The impact of this noise source on fish is analyzed in Section 4.4.2.7. The analysis in those sections concludes that, with the pile driving “soft-start” provision, underwater noise impacts on fish would be expected to be negligible. Based on this analysis, noise impacts from installation of piles on commercial and recreational fisheries would not be anticipated.

Site assessment activities would also add vessel traffic to that analyzed in the G&G Final PEIS (BOEM, 2014a). With the added traffic, vessel round trips would average 87 per port per year. This level of traffic is small relative to current traffic levels in the affected area (see Section 4.4.3.3, *Navigation/Vessel Traffic*). A temporary exclusion of vessel traffic for meteorological tower installation would be of short duration and over a small area (most likely a 1,500-foot radius of the location of installation). Given the relatively large area of the WEAs (307,590 acres), temporary exclusion in discreet areas during survey or meteorological tower installation is not expected to affect commercial and recreational fishing over the long term.

The Northeast Fisheries Science Center assessed the socioeconomic impact of wind energy development on fisheries along the U.S. Atlantic Coast (Kirkpatrick et al., 2014). This study shows that both commercial and recreational fishing intersect with the Kitty Hawk, Wilmington East, and Wilmington West WEAs. The study estimated just over $1 million in annual commercial fishing revenue from these WEAs. It also estimated that approximately 1.5% of for-hire recreational fishing trips leaving from Virginia and North Carolina ports could access at least one of the three analyzed WEAs. The study also notes, however, that acceptable alternative grounds exist at comparable costs (Kirkpatrick et al., 2014). Additionally, the portion of the Wilmington East WEA where fish are believed to congregate was removed from consideration during the area identification and public scoping process.

Conclusion

Based on the relative importance of the analyzed WEAs for local fisheries, the vessel traffic levels expected to be associated with site characterization surveys and site assessment activities, and the potential impact drivers from these activities, BOEM concludes that the impacts would be **negligible** to **minor.**

4.4.4.6 Visual Resources

Description of the Affected Environment

In order to assess impacts on visual resources, a viewshed, which is the area that is visible from a fixed vantage point, must be defined (NPS, 2014). The viewsheds that may be affected include the coastline of North Carolina and the open ocean surrounding the WEAs where site characterization (i.e., HRG survey and geotechnical sampling) and/or site assessment activities (i.e., installation of meteorological towers and/or buoys) may be visible. The scenic and aesthetic values of these coastal areas play an important role in attracting visitors. Kitty Hawk and Wilmington, NC, are both well-known tourist locations, with a mix of public, private, and residential beaches located nearby. Surrounding Kitty Hawk, there are four lighthouses along the

Outer Banks from Corolla, NC, to Ocracoke, NC, as well as resorts that have open ocean views. See Section 4.4.4.4 for a more detailed discussion of the tourism-related economy and recreational activities.

BOEM identified key viewpoints that are representative of the affected seascape and circumstances of perspective of onshore viewers of the WEAs. The viewpoints were selected based on consideration of the following criteria: proximity to the WEAs, availability of open views of the ocean and horizon, high public use and visitation, historical significance and sensitivity of the sites, and inclusion of views available from both the ground and elevated vantage points. The viewpoints selected for inclusion in the visual study are located in Appendix F and listed in Table 4-16.

Table 4-16
Viewpoints Selected for Inclusion in Visual Analysis

Viewpoint #	Viewpoint Name and Locations	Distance to Wind Energy Areas	Comments
1	Currituck Beach Lighthouse (Currituck County)	~27–43 miles to Kitty Hawk WEA	Elevated NRHP-listed
2	Corolla Public Beach (Currituck County)	~27–43 miles to Kitty Hawk WEA	Shorefront
3	Sunset Beach Pier (Brunswick County)	~11.5–21 miles to Wilmington West WEA ~32–56 miles to Wilmington East WEA	Shorefront
4	Bald Head Island Lighthouse (Bald Head Island, Brunswick County)	~12–26 miles to Wilmington West WEA ~19–33 miles to Wilmington East WEA	Elevated NRHP-listed
5	South Beach (Bald Head Island, Brunswick County)	~11.5–26 miles to Wilmington West WEA ~18.5–32 miles to Wilmington East WEA	Shorefront

Existing onshore infrastructure and development produce light pollution at some viewpoints; however, most viewpoints are typical of beaches and natural areas where little development is present. On most nights, lights from boats and ships can be seen on the ocean horizon from all locations of the coastline, except in foggy conditions. The intensity and size of the lights varies depending on the distance of the boat from the shore, and vessels remain within view different amounts of time depending on the direction and speed of the vessel.

It is worth noting that Viewpoints 1 and 2 (Currituck Beach Lighthouse and Corolla Public Beach) and Viewpoints 4 and 5 (Bald Head Island Lighthouse and South Beach on Bald Head Island) are close to one another. These pairings of nearby viewpoints were intentionally selected to allow for evaluation of the effect of viewer elevation on the potential visibility and perceived scale of the meteorological towers. Additionally, a time-lapse video was developed to represent how the meteorological tower would appear on the horizon over a 24-hour period. The video was taken from Sunset Beach Pier, which is closest to the Wilmington West WEA. The video can be viewed on the BOEM North Carolina website at http://www.boem.gov/state-activities-north-carolina/. The video simulates the appearance of the meteorological tower at different times during the day and night. Even at mid-day it is difficult to see the meteorological tower; it appears as a faint vertical line on the horizon.

Methodology

Both computer simulation modeling and field work to assess potential visual impacts of the meteorological towers and buoys were conducted. A three-dimensional computer model of the FINO 3 Meteorological Tower designed by Environmental Design & Research, Landscape Architecture, Engineering, & Environmental Services, D.P.C. (EDR) was developed based on specifications and photographs available on the manufacturer's website.[2] A to-scale computer model of the meteorological tower using AutoCAD® software was developed with detail sufficient to represent the appearance and potential visibility of tower components from onshore viewpoints. An elevation diagram of EDR's digital model of the FINO 3 Meteorological Tower (based on the manufacturer's specifications) is presented in Figure 4-17. Both panoramic and single-frame versions of the panoramic images are included in Appendix F. The panoramic images illustrate an approximately 124-degree field of view, which is generally accepted as the primary field of human view (NZILA, 2010).

The time and location of each photo were documented on all electronic equipment (e.g., camera, GPS unit) and noted on field maps and data sheets. This information is included with the simulations presented in Appendix F.

To show anticipated visual changes associated with the proposed action, high-resolution, computer-enhanced image processing was used to create realistic photographic simulations of the completed meteorological tower(s) from each of the five selected viewpoints. The photographic simulations were developed using conservative assumptions regarding the potential location of the tower relative to each viewpoint. For the purpose of presenting a conservative analysis, it is assumed that the proposed meteorological towers would be installed at the centerpoint of the nearest lease block within each WEA relative to the onshore viewpoints that were selected for the analysis. The assumed locations of the meteorological towers (for the purpose of preparing visual simulations) relative to each of the five selected viewpoints are presented in Appendix F.

[2] Specifications for the FINO 3 meteorological tower are available at http://www.fino3.de/en/fino3/design-of-the-fino3.

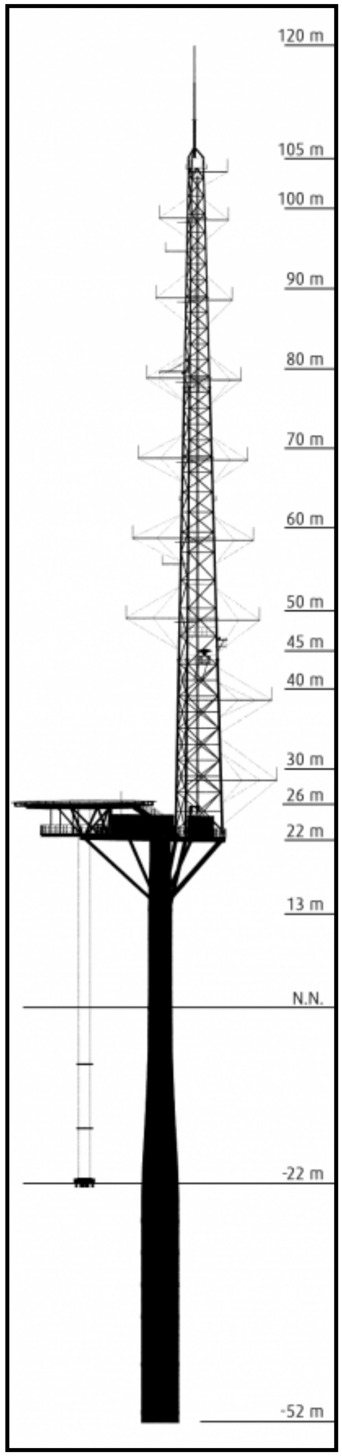


Figure 4-17 Elevation Diagram of FINO 3 Meteorological Tower

Schematic diagram available at: http://www.fino3.de/en/fino3/design-of-the-fino3.

To prepare nighttime simulations, BOEM reviewed the specification for L864 FAA obstruction warning lights. In addition, BOEM obtained actual nighttime photos from the Fenner Wind Farm, an operating wind power project in central New York state, to document the appearance of the FAA warning lights at night (Figure 4-18). Observations and photos were obtained from a distance of approximately 13 miles using a range of shutter speeds. These photos were then used to help simulate the correct appearance of the FAA warning lights on the proposed meteorological towers. The methodology, viewing instructions, and complete set of photographic simulations are provided in Appendix F.

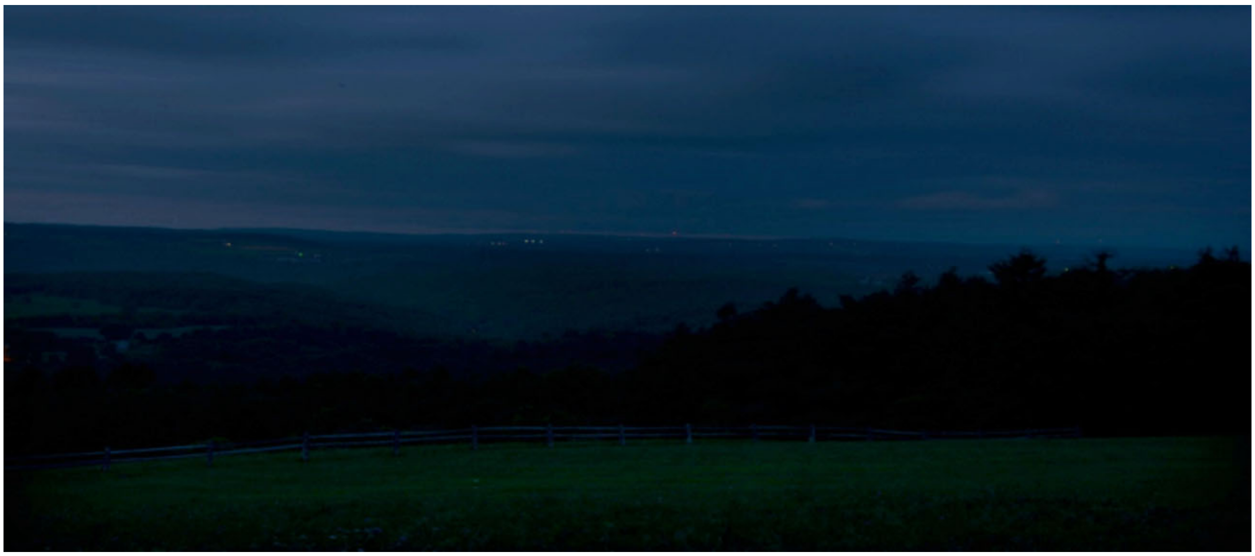


Figure 4-18 Nighttime Photograph of FAA Warning Lights

This photograph depicts the FAA warning lights at the Fenner Wind Farm at a distance of approximately 13 miles, comparable to the distance to the proposed meteorological towers from some of the viewpoints included in this analysis. Photo credit: EDR, 2014.

Photographs were obtained from each of the five selected viewpoints during a single field visit conducted between September 21 and 25, 2014. The fieldwork was scheduled based on a forecast of clear sky conditions. However, the actual weather was highly variable and included a mix of clear, partly cloudy, and overcast days. This provided a representative variety of sky/lighting conditions, and visibility of the horizon was relatively clear under all the weather conditions encountered. Information regarding the viewpoint location and elevation and the date on which photos were obtained at each viewpoint is summarized in Table 4-17.

Table 4-17
Viewpoint Summary Data

Viewpoint #	Viewpoint Name	Date (2014)	Latitude	Longitude	Elevation[1]	Orientation of View
1	Currituck Beach Lighthouse	September 21 and 22	36°22' 35.95"N	75°49' 50.30"W	148.3 feet	East
2	Corolla Public Beach	September 21 and 22	36°22' 36.6788"N	75°49' 27.4344"W	25.2 feet	East
3	Sunset Beach Pier	September 23 and 24	33°52' 0.8264"N	78°30' 21.6520"W	10.8 feet	Southeast
4	Bald Head Island Lighthouse	September 25	33°52' 24.6480"N	78°00' 1.3198"W	106.6 feet	South-southwest
5	South Beach (Bald Head Island)	September 25	33°51' 9.8325"N	77°59' 22.1390"W	9.4 feet	South-southwest
[1] Elevation is height above mean sea level with camera positioned approximately at eye level.						

A total of 15 daytime simulations and three nighttime simulations of the proposed meteorological towers were prepared (total of 18 simulations from five different viewpoints). These simulations depict the potential visibility and visual effects of the proposed towers at different times of day, under different weather conditions and a full range of lighting conditions. Information on the times of day and conditions depicted in each of the simulations is summarized in Table 4-18.

Table 4-18
Simulation Summary Data

Viewpoint #	Viewpoint Name	Time of Day[1]	Weather Conditions	Distance to Tower (miles)
1	Currituck Beach Lighthouse: morning	9:25 a.m.	Partly Cloudy	28.2
1	Currituck Beach Lighthouse: mid-day	12:30 p.m.	Clear	28.2
1	Currituck Beach Lighthouse: late afternoon	4:46 p.m.	Partly Sunny	28.2
2	Corolla Public Beach: morning	7:43 a.m.	Partly Cloudy	27.9

Viewpoint #	Viewpoint Name	Time of Day[1]	Weather Conditions	Distance to Tower (miles)
2	Corolla Public Beach: mid-day	1:43 p.m.	Clear	27.9
2	Corolla Public Beach: late afternoon	6:12 p.m.	Partly Sunny	27.9
2	Corolla Public Beach: evening	8:18 p.m.	Clear	27.9
3	Sunset Beach Pier: morning	9:18 a.m.	Overcast	13.2, 32.8
3	Sunset Beach Pier: mid-day	1:12 p.m.	Broken Overcast	13.2, 32.8
3	Sunset Beach Pier: late afternoon	5:13 p.m.	Overcast	13.2, 32.8
3	Sunset Beach Pier: evening	7:07 p.m.	Overcast	13.2, 32.8
4	Bald Head Island Lighthouse: early morning	10:26 p.m.	Overcast	12.7, 19.7
4	Bald Head Island Lighthouse: mid-day	2:52 p.m.	Overcast	12.7, 19.7
4	Bald Head Island Lighthouse: late afternoon	5:05 p.m.	Overcast	12.7, 19.7
5	South Beach (Bald Head Island): morning	9:17 a.m.	Overcast	12.2, 18.3
5	South Beach (Bald Head Island): mid-day	1:58 p.m.	Broken Overcast	12.2, 18.3
5	South Beach (Bald Head Island): afternoon	4:57 p.m.	Broken Overcast	12.2, 18.3
5	South Beach (Bald Head Island): evening	7:15 p.m.	Overcast	12.2, 18.3

[1] Eastern Daylight Saving Time

It is worth noting that the photographs and simulation from Bald Head Island Lighthouse (Viewpoint 4) were taken from the interior of the enclosed chamber at the top of the lighthouse, through glass windows. These photos represent the only publicly accessible view from this lighthouse. Reflections and subtle distortion from the glass are apparent in the photographs. This accurately conveys the view that is available and is perceived by visitors to the lighthouse.

Impact Analysis of Alternative A

Routine Activities

Site Characterization Surveys

Impacts on visual resources from increased vessel and aviation traffic for site characterization surveys would be temporary and minimal.

Site Assessment Activities and Data Collection Structures

The potential structures that could be built as part of wind leasing activities include meteorological towers and buoys. It is anticipated that one meteorological tower will be erected within each WEA. Because of the distance of the WEAs from shore, it is anticipated that buoys installed within the WEAs will not be visible from shore. Therefore, the potential visual effect of buoys is not considered in this analysis. As described in Section 5.2.21.2 of the PEIS (MMS, 2007a), a meteorological tower in a typical seascape could introduce a vertical line that would contrast with the horizon line and introduce a geometrical manmade element to a natural landscape.

The precise model and specifications of a meteorological tower that may be installed as part of proposed project is not known at this time. However, for the purpose of presenting a conservative analysis, BOEM based analysis of potential visual effects on the FINO 3 Meteorological Tower. The FINO 3 tower represents one of the tallest meteorological towers that is currently being deployed for commercial offshore wind development and therefore provides a "worst-case" scenario for evaluating potential visibility and visual effects.

As shown in Figure 4-17, the maximum height of the FINO 3 tower is 120 meters above the average sea level. The tower is built on a monopole structure that extends up to 22 meters below the water, with an additional 30 meters embedded within the seafloor. The monopole rises to a 13-by-13-meter service platform at an elevation of 22 meters above the water line. A lattice structure with numerous arms (where meteorological sensors would be located) rises from the service platform to 105 meters above the water. An FAA obstruction warning light is located at the top of the structure, and a 15-meter antennae structure extends up from that (i.e., from 105 to 120 meters above the water).

Because of the effect of distance, the overall visibility of the meteorological towers would be relatively minimal when viewed from shoreline locations (occupying less than 1% of the visible seascape). As shown in the simulations from Viewpoint 3, at distances of approximately 12 miles, the shape of the meteorological tower and its various components (monopole, platform, and lattice tower) are discernible. At greater distances, the meteorological towers appear as thin, faint, vertical lines at the horizon (see Appendix F for additional details). Because of distance, the perceived scale of the meteorological towers is not significantly greater when viewed from elevated vantage points (compare simulations for Viewpoints 1 and 2 and for Viewpoints 4 and 5). For both Currituck Beach Lighthouse and Corolla Beach (Viewpoints 1 and 2) and Bald Head Island Lighthouse and South Beach at Bald Head Island (Viewpoints 4 and 5), the scale of the meteorological towers appears identical regardless of whether they are being viewed from shoreline or elevated (lighthouse) vantage points. Atmospheric haze reduces visibility, sometimes significantly, and the presence of waves obscures objects very low on the horizon; maximum theoretical viewing distances typically exceed what is experienced in reality. Limits to human visual acuity reduce the ability to discern objects at great distances, suggesting that even the tips of the towers may not be discernible at the maximum distances (BOEM, 2014f). Furthermore, nighttime lighting would be similar to lights from existing vessel traffic.

Non-Routine Events

There would be negligible impacts from non-routine events such as allisions/collisions and spills on the visual resources of the WEAs.

Conclusion

The overall visibility of the meteorological towers is expected to be relatively minimal when viewed from shoreline locations (occupying less than 1% of the visible seascape), even when viewed from higher elevations. Atmospheric haze reduces visibility and wave action can obscure objects very low on the horizon. Limits to human visual acuity also reduce the ability to discern objects at great distances, and nighttime lighting on the meteorological towers would be similar to lights visible from existing vessel traffic. Based on the foregoing, BOEM has concluded that visual impacts as a result of the proposed action would be **negligible.**

4.5 Alternative B, North Atlantic Right Whale Area Exclusion

Alternative B would exclude the entire Wilmington West WEA from leasing and site-assessment activities. During the scoping process, concerns were raised over development of the Wilmington West and Wilmington East WEAs because of potential obstruction of North Atlantic right whale migration and increases in potential for North Atlantic right whales to utilize the Cape Fear TSS. NOAA requested that BOEM "demonstrate that wind farm planning, construction and operations with the Call Areas will not:

- Interfere with (obstruct) North Atlantic right whale migration along the mid-Atlantic.
- Cause serious injury or mortality to North Atlantic right whales.
- Cause migrating North Atlantic right whales to avoid the wind turbine fields and funnel into the Wilmington ship channel, resulting in an increased risk of vessel collisions to North Atlantic right whales."

4.5.1 Air Quality

Alternative B would entail the same types of activities as Alternative A, but the total amount of activity would be less because Alternative B does not include the Wilmington West WEA. Results from the Alternative A analysis (Section 4.4.1.1) indicate negligible impacts on air quality that would not be expected to lead to any violation of the NAAQS. The total emissions and any effects on air quality would be correspondingly lower for Alternative B than for Alternative A, and would therefore also be **negligible**.

4.5.2 Water Quality

Section 4.4.1.2, which describes the reasonably foreseeable impacts of Alternative A on water quality, concludes that surveys, sampling, and vessel traffic associated with the proposed action would have no measurable impact on current or projected future water quality. Because the offshore area associated with Alternative B is smaller than the areas under Alternative A and there would only be two meteorological towers constructed and/or four buoys deployed (compared with three towers and six buoys under Alternative A), Alternative B would have approximately 65% of the vessel traffic associated with Alternative A, and the intensity of impacts on water quality under Alternative B would be lower than the impacts described for Alternative A. Therefore, there would be no measurable effect on water quality under Alternative B and impacts would also be **minor**.

4.5.3 Biological Resources

4.5.3.1 Birds

Effects on birds under Alternative B would be similar to the impacts described for Alternative A (Section 4.4.2.1), which are minor and negligible. Because Alternative B includes a reduction of the number of WEAs (Wilmington West WEA removed), there would be fewer meteorological towers and/or buoys to install, thereby reducing the number of vessel trips and the length of time that noise could disturb birds. Additionally, although the proposed monopole design (without guy wire) of meteorological towers is not anticipated to result in substantive increases in collision potential, one less meteorological tower would further reduce the already limited collision potential. Therefore, the potential for impacts on birds would be lower than what is described for Alternative A and would also be **negligible**.

4.5.3.2 Bats

Effects on bats under Alternative B would be similar to the impacts described for Alternative A (Section 4.4.2.2), which are negligible. Because Alternative B includes a reduction of the number of WEAs (Wilmington West WEA removed), the potential for impacts on bats would be lower than described for Alternative A because there would be fewer meteorological towers and/or buoys and there would be one less area that contains a feature that could either attract or cause avoidance behavior of bats that may be present. Additionally, as noted in Alternative A, data collection activities (e.g., biological surveys) that could assist in future environmental analyses of impacts of OCS activities on bats would be limited to only two WEAs, and potential useful data from the Wilmington West WEA would not be gathered. Impacts on bats under Alternative B would be **negligible**.

4.5.3.3 Benthic Resources

Effects on benthic communities under Alternative B would be similar to the impacts described for Alternative A (Section 4.4.2.3), which are negligible. Because Alternative B includes a reduction of the number of WEAs (Wilmington West WEA removed), the area of disturbance on the seafloor would be reduced, thereby reducing potential for benthic community impacts. Therefore, impacts on benthic communities under Alternative B would be less than described for Alternative A. With implementation of the BOEM standard policy to avoid impacts on sensitive benthic resources and because benthic communities typically recover in 1 to 3 years, impacts on benthic communities under Alternative B would be **negligible** to **minor**.

4.5.3.4 Coastal Habitats

Effects on coastal habitats under Alternative B would be similar to the impacts described for Alternative A (Section 4.4.2.4), which are negligible. Because Alternative B would remove the Wilmington West WEA and the associated meteorological tower and/or buoys, the potential for coastal habitat impacts would be lower than described for Alternative A. Therefore, effects on coastal habitats would be **negligible**.

4.5.3.5 Marine Mammals

Effects on marine mammals under Alternative B would be similar to the impacts described for Alternative A (Section 4.4.2.5), which are negligible to moderate. Because Alternative B includes a reduction of the number of WEAs (Wilmington West WEA removed), the potential for marine mammal impacts would be lower than described for Alternative A. This would be the case especially for North Atlantic right whales, because Alternative B is intended to reduce potential effects on these whales that may utilize the Wilmington West WEA during their migratory periods.

Alternative B was developed due to the concern of constraining North Atlantic right whale movement between the Wilmington West and Wilmington East WEAs and funneling them into the Wilmington TSS during North Atlantic right whale migration, thereby increasing the potential of ships colliding with these whales.

Although north Atlantic right whale distribution within the Wilmington West WEA and surrounding areas is generally limited, and considering that the proposed action covers the short-term construction and decommissioning of only one meteorological tower and/or installation of two meteorological buoys in each of the Wilmington West and East WEAs, it is anticipated that the installation, construction, and operation of these structures may result in temporary displacement of North Atlantic right whales. However, these activities are not anticipated to obstruct north Atlantic right whale migration along the mid-Atlantic, resulting in **negligible** to **minor** impacts**.**

Evidence suggests that collisions of ships with North Atlantic right whales are a major source of injury and mortality (Kraus, 1990). Considering the distance to Kitty Hawk from the Wilmington West and Wilmington East WEAs, the vessel trip comparisons are depicted between the two Wilmington WEAs only. Although the impacts from vessel traffic are anticipated to be negligible (BOEM, 2012b), reducing the number of ship transits or restricting timing of transits to periods when North Atlantic right whales are less likely to be found in the WEAs would reduce the likelihood of ships striking these whales. Because Alternative B would preclude site characterization and site assessment activities in the Wilmington West WEA, the subsequent decrease in ship transits would likely result in a commensurate reduction of potential North Atlantic right whale vessel strikes. Removing the Wilmington West WEA would reduce the number of vessel trips by approximately 690, a 55% decrease in the number of project-related vessel trips in the Wilmington TSS vicinity under Alternative A (which would have a maximum of 1,204 vessel trips). Although this decrease in vessel activity is anticipated to reduce the potential of North Atlantic right whale vessel strikes when comparing Alternative B with Alternative A, Alternative B would not entirely exclude the potential for North Atlantic right whale vessel strikes; therefore, effects of vessel activity on North Atlantic right whales under Alternative B would still be **minor** to **moderate**.

Alternative B would remove the Wilmington West WEA and therefore preclude the potential for overlapping with the proposed extension of North Atlantic right whale critical habitat in this area. The small area of overlap with the proposed extension of critical habitat in the Wilmington East WEA would be the same under Alternative B and the proposed action. As discussed under Alternative A, placement of meteorological towers and buoys would not result in fragmentation of North Atlantic right whale cow/calf habitat because of the small footprint of the meteorological towers and buoys. Because Alternative B removes the Wilmington West WEA, the effects on proposed North Atlantic right whale critical habitat may be further reduced and overall effects would be **negligible**.

All SOCs for marine mammals described in Alternative A would be implemented under Alternative B, as would consultation with NMFS for any site assessment activities not covered by the NMFS G&G BO (NMFS, 2013a and 2015). Installation of meteorological towers requires pile driving, which could result in **minor to moderate** effects on marine mammals. Impacts on marine mammals as a result of the surveying activities as described in the proposed action would be **negligible** to **minor**.

4.5.3.6 Sea Turtles

Effects on sea turtles under Alternative B from site characterization activities would be similar to the impacts described for Alternative A (Section 4.4.2.6), which are negligible to minor. Because Alternative B would remove the Wilmington West WEA and the associated meteorological tower and/or buoys, the potential for sea turtle impacts would be lower than described for Alternative A. All SOCs for marine mammals and sea turtles described in Alternative A would be implemented under Alternative B and would help to reduce potential effects on sea turtles. Additional consultation for any site assessment activities (e.g., installation of meteorological towers) not covered by the G&G NMFS BO (NMFS, 2013a) would be conducted (see BOEM letter to NMFS and NMFS concurrence letter in Appendix E). Installation of meteorological towers requires pile driving, which could result in **minor** to **moderate** effects on sea turtles. Impacts on sea turtles as a result of the surveying activities under Alternative B would be **negligible** to **minor,** as described in the proposed action.

4.5.3.7 Finfish and Essential Fish Habitat

Effects on fish and fish habitat under Alternative B would be similar to the impacts described for Alternative A (Section 4.4.2.7), which are negligible. Because Alternative B would remove the Wilmington West WEA and the associated meteorological tower and/or buoys, the potential for fish and fish habitat impacts would be lower than described for Alternative A. Additional consultation for any site assessment activities (e.g., installation of meteorological towers) not covered by the G&G NMFS BO (NMFS, 2013a) would be conducted (see BOEM letter to NMFS and NMFS concurrence letter in Appendix E). Installation of meteorological towers requires pile driving, which could result in **negligible** to **minor** effects on federally listed fish species. If a lessee proposes these activities in a site assessment plan, BOEM will initiate a

Section 7 consultation with NMFS. Impacts on fish and essential fish habitat as a result of the surveying activities as described in the proposed action would be **negligible**.

4.5.4 Land Use and Coastal Infrastructure

Impacts described under Alternative A (Section 4.4.3.1) would be essentially the same under Alternative B; however, because there would be one less WEA, these effects would be less than those under Alternative A, which were found to be negligible. Therefore, impacts on coastal infrastructure would be **negligible**.

4.5.4.1 Military Use

Impacts described under Alternative A (Section 4.4.3.2) would be essentially the same under Alternative B; however, because there would be one less WEA, these effects would be less than those under Alternative A, which were found to be minor. Therefore, impacts on military use would be **negligible**.

4.5.4.2 Navigation/Vessel Traffic

Section 4.4.3.3, which describes the reasonably foreseeable impacts of Alternative A on navigation and vessel traffic, concludes that the increase in vessel traffic associated with the proposed action would not measurably affect current or projected future shipping or navigation. Because the offshore area associated with Alternative B is smaller than the area under Alternative A and there would only be two meteorological towers constructed or four buoys deployed (compared with three towers and six buoys under Alternative A), Alternative B would have approximately 65% of the vessel traffic associated with Alternative A, and the intensity of impacts on vessel traffic under Alternative B would be lower than the impacts described for Alternative A (see Table 4-19). Therefore, effects would be **minor**.

Table 4-19
Vessel Round Trips for Alternative B

WEA	OCS Blocks	HRG Surveys	Cable Surveys	Geotechnical Sampling Surveys	Avian Surveys	Fish Surveys	Meteorological Buoys	Meteorological Towers
Kitty Hawk WEA	21.5	236	1	467	72–108	N/A	6–12	120
Wilmington East WEA	25	275	1	213	24–36	N/A	80–240	40–520
Total Alternative B	46.5	511	2	680	96–144	36	88–256	200–680

4.5.5 Socioeconomic Resources

4.5.5.1 Cultural, Historical, and Archaeological Resources

Activities under Alternative B would be the same as those described under Alternative A (Section 4.4.4.1). Although Alternative B has one less WEA than Alternative A and would result in less disturbance of the seafloor where cultural or historic resources may be located, potential impacts on cultural or historical resources would be generally the same, and activities undertaken under Alternative B would adhere to the same policies, procedures, and regulatory requirements as Alternative A. Impacts on cultural and historic resources resulting from Alternative B would be **negligible**.

4.5.5.2 Demographics and Employment

Alternative B would exclude the Wilmington West WEA from leasing and site assessment activities. Demographic and employment impacts on port areas closest to this WEA would be **negligible** to **minor**.

4.5.5.3 Environmental Justice

Because no high and adverse human health or environmental effects were identified in this EA from the alternatives analyzed, no disproportionately high or adverse human health or environmental effects would be expected.

4.5.5.4 Recreation and Tourism

Alternative B would exclude the Wilmington West WEA from leasing and site assessment activities. Impacts on nearby coastal areas from generation of trash and debris and from accidental diesel fuel spills would be less than under Alternative A (Section 4.4.4.4). Impacts on recreation and tourism would remain **negligible** to **minor**.

4.5.5.5 Commercial and Recreational Fisheries

Alternative B would exclude the Wilmington West WEA from leasing and site assessment activities. The reduced vessel traffic through fish harvesting areas would reduce impacts on commercial and recreational fisheries relative to Alternative A (Section 4.4.4.5). The impacts on commercial and recreational fisheries would remain **negligible** to **minor**.

4.5.5.6 Visual Resources

Alternative B would include the same types of activities as Alternative A and would have similar impacts. Because Alternative B would remove the Wilmington West WEA and the associated meteorological tower and/or buoys, there would be fewer visual impacts. The elimination of the Wilmington West WEA would further reduce visual impacts because it is the closest WEA to shore, and the remaining two meteorological towers (in the Wilmington East and Kitty Hawk WEAs) would be at least 15 nm from shore. Any effects on visual resources would be correspondingly reduced under Alternative B compared with effects under Alternative A

(Section 4.4.4.6), which were negligible. Therefore, visual effects under Alternative B would also be **negligible.**

4.6 Alternative C

Alternative C expands the existing seasonal pile driving restriction to include site characterization activities (surveys) as well. This alternative would limit vessel activity by excluding high-resolution G&G surveys during peak migration of North Atlantic right whales. The period of peak migration of North Atlantic right whales is November 1 through April 30. Vessel traffic not associated with high-resolution G&G surveys (e.g., vessel-based and aerial avian, bat, marine mammal, sea turtle, and fish surveys) would not be restricted.

4.6.1 Air Quality

Alternative C would entail the same types and amounts of activities as Alternative A, but a portion of the activity would shift seasonally from the winter months to the remainder of the year. The total annual emissions and any effects on air quality would be the same on an annual basis for Alternative C as for Alternative A, as shown in Table 4-1 in Section 4.4.1.1. However, because Alternative C would shift some emissions from the winter months to the remainder of the year, the maximum short-term (24 hours or fewer) concentrations of air pollutants could be slightly higher in the warmer seasons with Alternative C than with Alternative A. Any increased air quality effects during the warmer seasons are expected to be negligible. Therefore, air quality effects under Alternative C would be nearly the same as effects under Alternative A, which would be **negligible**.

4.6.2 Water Quality

Section 4.4.1.2, which describes the reasonably foreseeable impacts of Alternative A on water quality, concludes that the surveys, sampling, and vessel traffic associated with the proposed action would not measurably affect current or projected future water quality. Because the offshore area associated with Alternative C is the same size as Alternative A and the same number of meteorological towers and/or buoys would be used, Alternative C would have the same water quality impacts as described for Alternative A, which would be **minor**.

4.6.3 Biological Resources

4.6.3.1 Birds

Effects on birds under to Alternative C would be similar to the impacts described for Alternative A (Section 4.4.2.1), which are minor and negligible. While all alternatives include seasonal restrictions on pile driving due to concerns about impacts on North Atlantic right whales, Alternative C expands these restrictions to include all offshore activities. This includes high-resolution G&G surveys during peak migration of North Atlantic right whales. These seasonal restrictions would only allow surveys to occur from May through October, which could result in decreased impacts on bird species that migrate between November and April. Some birds can migrate during the summer months, and the impacts on these birds would be no greater than what is described for Alternative A, which would be **negligible.**

4.6.3.2 Bats

Effects on bats under Alternative C would be similar to the impacts described for Alternative A (Section 4.4.2.2), which are negligible. Alternative C includes seasonal restrictions on high-resolution G&G surveys during peak migration of North Atlantic right whales. These seasonal restrictions would cause meteorological tower installation activities and surveys to occur between May and October; however, the presence of bats would still be marginal in the WEAs, and the impacts would be similar to what is described for Alternative A. Therefore, impacts on bats under Alternative C would be **negligible**.

4.6.3.3 Benthic Resources

Effects on benthic communities from Alternative C would be similar to the impacts described for Alternative A (Section 4.4.2.3), which would be negligible. Alternative C includes seasonal restrictions on high-resolution G&G surveys during peak migration of North Atlantic right whales. These seasonal restrictions would cause meteorological tower installation activities and surveys to occur between May and October. However, seasonal restrictions on surveys would not change the extent of potential impacts on benthic communities compared to Alternative A because the number of meteorological towers and buoys would be equivalent and seafloor disturbance would be the same. With implementation of the BOEM standard policy to avoid impacts on sensitive benthic resources and because benthic communities typically recover within 1 to 3 years, impacts on benthic communities under Alternative C would **negligible** to **minor**.

4.6.3.4 Coastal Habitats

Effects on coastal habitats under Alternative C would be similar to the impacts described for Alternative A (Section 4.4.2.4), which are negligible. Alternative C includes seasonal restrictions on high-resolution G&G surveys during peak migration of North Atlantic right whales. These seasonal restrictions would not change the potential impact on coastal habitats compared with Alternative A because the number of meteorological towers and buoys would be the same and the same onshore support facilities would be utilized. Therefore, impacts on coastal habitats as a result of Alternative C would be **negligible**.

4.6.3.5 Marine Mammals

Effects on marine mammals from Alternative C would be similar to the impacts described for Alternative A (Section 4.4.2.5), which would be negligible to moderate. Alternative C includes seasonal restrictions on high-resolution G&G surveys during peak migration of North Atlantic right whales. These seasonal restrictions would allow survey activities to occur only between May and October, which would result in decreased underwater noise and potential vessel strike impacts on North Atlantic right whales and other marine mammals compared to Alternatives A and B. However, in general, the effects of survey activities on North Atlantic right whales are anticipated to be negligible to minor. Therefore, effects on North Atlantic right whales under Alternative C would remain **negligible** to **minor**. In addition to the site characterization seasonal restrictions, all SOCs for marine mammals described in Alternative A would be implemented under Alternative C, as would consultation for any site assessment activities not covered by the G&G NMFS BO (NMFS, 2013a) (see BOEM letter to NMFS and NMFS concurrence letter in

Appendix E). Installation of meteorological towers requires pile driving, which could result in **minor** to **moderate** effects on marine mammals.

As discussed under Alternative A, placement of meteorological towers and buoys would not result in fragmentation of North Atlantic right whale calving/nursery habitat because of the small footprint of the meteorological towers and buoys. Because Alternative C would construct the same number of meteorological towers and buoys as the proposed action (Alternative A), effects on proposed North Atlantic right whale critical habitat would be the same, at **negligible** to **minor** levels.

4.6.3.6 Sea Turtles

Effects on sea turtles under Alternative C for site characterization activities would be similar to the impacts described for Alternative A (Section 4.4.2.6), which would be negligible to minor. Alternative C includes seasonal restrictions, which would allow high-resolution G&G surveys to occur only between May and October. These seasonal restrictions would result in decreased underwater noise and potential vessel strike impacts on sea turtles compared to Alternatives A and B. However, although the effects of survey activities on sea turtles are anticipated to be generally **minor**, this survey season would be focused during sea turtle nesting season. In addition to the site characterization seasonal restrictions, all SOCs for marine mammals and sea turtles described in Alternative A would be implemented under Alternative C and would help to reduce potential effects on sea turtles. Additional consultation for any site assessment activities (e.g., installation of meteorological towers) not covered by the G&G NMFS BO would be conducted (see BOEM letter to NMFS and NMFS concurrence letter in Appendix E). Installation of meteorological towers requires pile driving, which could result in **minor** to **moderate** effects on sea turtles.

4.6.3.7 Fish and Essential Fish Habitat

Effects on fish and fish habitat under Alternative C would be similar to the impacts described for Alternative A (Section 4.4.2.7), which would be negligible. Because Alternative C expands seasonal restrictions on surveys, the potential for fish and fish habitat impacts would be lower than described for Alternative A. Additional consultation for any site assessment activities (e.g., installation of meteorological towers) not covered by the G&G NMFS BO (NMFS, 2013a) would be conducted (see BOEM letter to NMFS and NMFS concurrence letter in Appendix E). Installation of meteorological towers requires pile driving, which could result in **negligible** to **minor** effects on federally listed fish species. If a lessee proposes these activities in a site assessment plan, BOEM will initiate a Section 7 consultation with NMFS.

4.6.4 Land Use and Coastal Infrastructure

Impacts described under Alternative A (Section 4.4.3.1) would be essentially the same under Alternative C because Alternative C is essentially the same as Alternative A, but requires all activities occur between May and November. Impacts on coastal infrastructure under Alternative A were found to be negligible. Therefore, impacts on coastal infrastructure under Alternative C would also be **negligible**.

4.6.4.1 Military Use

Impacts described under Alternative A (Section 4.4.3.2) would be essentially the same under Alternative C because Alternative C is essentially the same as Alternative A, but requires all activities occur between May and November. Impacts on military uses under Alternative A were found to be minor. Therefore, impacts on military use under Alternative C would also be **minor**.

4.6.4.2 Navigation/Vessel Traffic

Section 4.4.3.3, which describes the reasonably foreseeable impacts of Alternative A on navigation and vessel traffic, concludes that the increase in vessel traffic associated with the proposed action would not measurably affect current or projected future shipping or navigation. Because the offshore area associated with Alternative C is the same size as that of Alternative A and the same number of meteorological towers and/or buoys would be used, Alternative C would have the same amount of vessel traffic and the same impacts described for Alternative A. Impacts would therefore be **minor** (see Table 4-20 for total vessel traffic under Alternative C).

Table 4-20
Vessel Round Trips for Alternative C

WEA	OCS Blocks	HRG Surveys	Cable Surveys	Geotechnical Sampling Surveys	Avian Surveys	Fish Surveys	Meteorological Buoys	Meteorological Towers
Kitty Hawk WEA	21.5	236	1	467	72–108	N/A	6–12	120
Wilmington East WEA	25	275	1	213	24–36	N/A	120–360	60–780
Wilmington West WEA	9	99	1	524	72–108	N/A	6–12	120
Total Alternative C	55.5	610	3	1204	171–252	60	132–384	300–1,020

4.6.5 Socioeconomic Resources

4.6.5.1 Cultural, Historical, and Archaeological Resources

Impacts described under Alternative A (Section 4.5.5.1) would be essentially the same under Alternative C because Alternative C is essentially the same as Alternative A but requires all activities occur between May and October. Impacts on cultural and historic resources under Alternative A are predicted to be to be negligible and would be the same under Alternative C. Therefore, impacts on cultural and historic resources under Alternative C would be **negligible**.

4.6.5.2 Demographics and Employment

Alternative C would limit vessel traffic during the period between November 1 and April 30. Demographic and employment impacts on port areas would most likely be concentrated during the remaining 6 months of the year. Peak employment derived from site characterization surveys and site assessment activities would be higher than under Alternative A. However, because of the small number of vessel round trips relative to current navigation (Section 4.4.3.3), demographic and employment impacts would remain **negligible** to **minor**.

4.6.5.3 Environmental Justice

Because no high and adverse human health or environmental effects were identified in this EA from the alternatives analyzed, no disproportionately high and adverse human health or environmental effects would be expected.

4.6.5.4 Recreation and Tourism

Alternative C would limit vessel traffic during the period between November 1 and April 30. The potential generation of trash and debris and accidental diesel spills would likely be concentrated during the remaining 6 months of the year. This would coincide with the period of summer recreational use of coastal areas. However, because the expected generation of trash and debris would remain small, as would the harm done by accidental diesel spills, impacts on recreation and tourism would be **negligible** to **minor**.

4.6.5.5 Commercial and Recreational Fisheries

Alternative C would limit vessel traffic between November 1 and April 30. This would likely concentrate traffic during the remaining 6 months of the year. Figure 4-21 of the G&G Final PEIS (BOEM, 2014a) shows how commercial landings off the Atlantic Coast tend to peak during the months of May through August. Figure 4-27 of the G&G Final PEIS (BOEM, 2014a) shows how recreational angler trips in North Carolina also tend to peak during the same period. Impacts on commercial and recreational fisheries would likely increase relative to those of Alternative A (Section 4.4.4.5). However, because of the relatively low number of vessel round trips associated with the proposed activities, impacts on commercial and recreational fisheries would be **negligible** to **minor**.

4.6.5.6 Visual Resources

Activities under Alternative C would be the same as those under Alternative A. However, all activities would be required to occur between May and November. Timing of activities would not change the outcome of the visual analysis or determination of impacts. Therefore, visual effects under Alternative C would be the same as effects under Alternative A (Section 4.4.4.6), which would be **negligible**.

4.7 Alternative D – No Action

Under the No-Action Alternative, no wind energy leases would be issued, and no site assessment activities would be approved within the WEAs offshore North Carolina. This would eliminate or at least postpone vessel traffic associated with site assessment (construction and installation of meteorological towers and buoys). Site characterization surveys are not under BOEM's jurisdiction and could still be conducted; however, these activities would not be likely to occur without the possibility of a commercial energy lease.

4.7.1 Air Quality

Under Alternative D, there would be no activity that requires emission-producing vehicles such as vessels or pile drivers associated with installation and operation of meteorological towers or buoys; therefore, there would be no effects on air quality under Alternative D.

4.7.2 Water Quality

Under Alternative D, there would be no activity that could affect water quality, such as vessels or construction equipment that can result in turbidity, fuel, or waste discharges, associated with installation and operation of meteorological towers or buoys; therefore, there would be no effects on water quality under Alternative D.

4.7.3 Biological Resources

Under Alternative D, there would be no activity associated with site assessment activities or installation and operation of meteorological towers or buoys. Biological surveys that may be conducted under Alternatives A, B, or C would also not occur and would preclude collection of data related to bats, birds, and other marine species that could be used to assist in future analyses of offshore activities. Although this data may be useful for future offshore activities and for developing additional avoidance and minimization measures, as well as gaining a better understanding of habitat utilization in the area overall, there would be no effects on biological resources under Alternative D.

4.7.4 Land Use and Coastal Infrastructure

There would be no impacts on coastal infrastructure and land use under Alternative D, because no use of land-based features would occur. Additionally, there would be no impacts on vessel traffic because no temporary increase in vessels in the WEAs would occur under the No-Action Alternative.

4.7.5 Socioeconomic Resources

Under Alternative D, there would be no impacts on cultural or historic resources because no activities with potential to encounter or disturb these resources would occur. There would be no effects on visual resources under the No-Action Alternative because no structures would be installed and no activities would occur.

Under Alternative D, there would be no added employment around onshore support areas for site characterization surveys and site assessment activities. Under Alternative D, there would be no high and adverse human health or environmental impacts associated with site characterization surveys or site assessment activities. There would be no impacts on tourism and recreation from generation of trash and debris or diesel fuel spills associated with site characterization surveys or site assessment activities. The No-Action Alternative would not result in any impacts on commercial or recreational fisheries associated with site characterization surveys or site assessment activities.

4.8 Cumulative Impacts

Cumulative impacts are the incremental effects of the proposed action on the environment when added to other past, present, or reasonably foreseeable future actions taking place within the region of the WEA, regardless of which agency or person undertakes the actions (see 40 CFR 1508.7). Cumulative impacts can result from individually minor but collectively significant actions taking place over a given period. This section identifies potential cumulative impacts over the 5-year life of the proposed action (2015–2020), focusing on the incremental contribution of the proposed action to other current and reasonably foreseeable future actions.

4.8.1 Overview

The G&G Final PEIS (BOEM, 2014a) included an assessment of potential cumulative impacts of existing and future oil and gas development activities, construction and operation of liquid natural gas facilities, marine transport, commercial and recreational fishing, other recreational activities, dredging for sand and gravel, construction of artificial reefs, and military use. The geographic region for the cumulative impact assessment included the coast of North Carolina. The G&G Final PEIS (BOEM, 2014a) looked at activities occurring in state waters and included proposed alternative energy projects as well as many of the activities also occurring on the OCS. The G&G Final PEIS (BOEM, 2014a) concluded that other, non-renewable energy activities had impact-producing factors similar to those considered for alternative energy facilities. Those conclusions are hereby incorporated by reference. Therefore, the following cumulative impact analysis focuses on the incremental contribution of the proposed action and alternatives to potential cumulative effects.

4.8.2 Existing and Future Reasonably Foreseeable Activities and Projects

Onshore activities for the proposed action that were considered include those related to tower and buoy staging, and loading and launching support vessels involved in the installation, operation, and decommissioning activities. Impact-producing factors include acoustic disturbances from vessels, vessel traffic, trash and debris, operational discharges from vessels, and fuel spills. Effects associated with vessel traffic and use are the primary contributor to potential onshore cumulative effects.

Offshore activities for the proposed action include those related to movement of crews and materials to and from the shore to the WEAs for site characterization and meteorological tower and/or buoy installation and decommissioning. Because installation and decommissioning would be a short-term effect (limited to 8 to 10 weeks per tower), vessel traffic that is ongoing throughout the 5-year lifespan of the project is considered the primary contributor to potential offshore cumulative effects.

Section 4.4.3.3 of this EA discusses the major and minor ports that could be used for site characterization and assessment activities associated with the proposed action: Port of Virginia, VA; Port of Wilmington, NC; Port of Charleston, SC; Port of Morehead City, NC; Port of Wanchese, NC; Southport Marina, NC; Hatteras Harbor Marina, NC; and Port of Georgetown, SC. Combined, the total annual vessel trips associated with the Port of Virginia, Port of Wilmington, Port of Charleston, Port of Morehead City, and Port of Wanchese is 4,238 (USDOT MARAD, 2013; NCP, 2013; NOAA, 2013b). Total known vessels operating out of Southport Marina, Hatteras Harbor Marina, and Port of Georgetown is approximately 272 (this total does not include all recreational boats and vessels that may be present) (Southport Marina, 2014; Hatteras Harbor Marina, 2014).

The total number of vessel trips associated with the proposed action could be as high as 3,589. Some of these vessels are anticipated to be large ships that would require use of one or more of the major ports discussed above, while others would be smaller and could launch from one or more of the minor ports. The majority of the total vessel trips are likely to occur in years one through three, but for purposes of the EA analysis, the trips have been averaged by year. Therefore, approximately 718 vessel trips per year over 5 years would result from the proposed action.

4.8.2.1 Atlantic OCS Mid-Atlantic Planning Area

- The Delaware lease areas are made up of 11 whole OCS blocks and 16 partial blocks. The closest point to shore is approximately 11 nm due east from Rehoboth Beach, Delaware. The entire area is approximately 122 square nm (103,323 acres [41,813 hectares]).
- The Maryland lease areas are made up of nine whole OCS blocks and 11 partial blocks. The western edge of the WEA is approximately 10 nm from the Ocean City, Maryland, coast, and the eastern edge is approximately 27 nm from the Ocean City coast. The entire area is approximately 94 square nm (79,706 acres [32,256 hectares]).
- The Virginia lease area consists of 22 whole OCS blocks and four partial blocks. The western edge of the area is approximately 18 nm from Virginia Beach, VA, and the eastern edge is approximately 37 nm from Virginia Beach. The entire area is approximately 164 square nm (138,788 acres [56,165 hectares]).

4.8.3 Reasonably Foreseeable Cumulative Impacts

4.8.3.1 Physical Resources

Air Quality

The additional air emissions from the 4,238 vessel round trips associated with the proposed action would be relatively small compared with the existing and projected future vessel traffic in the vicinity's heavily used waterways and ports, and would not represent a substantive incremental contribution to cumulative impacts on air quality. Impacts would therefore be **negligible**.

Global Climate Change

Activities, which include Alternative A, could affect global climate change. Section 7.6.1.4 of the PEIS (MMS, 2007a) describes global climate change with respect to renewable energy development. The following is a summary of that information and incorporates new information specific to Alternative A.

The temperature of the earth's atmosphere is regulated by a balance between the radiation received from the sun, the amount reflected by the earth's surface and clouds, the amount of radiation absorbed by the earth, and the amount re-emitted to space as long-wave radiation. Greenhouse gases (GHGs) keep the earth's surface warmer than it would otherwise be because they absorb infrared radiation from the earth and, in turn, radiate this energy back down to the surface. Although these gases occur naturally in the atmosphere, there has been a rapid increase in concentrations of GHGs in the earth's atmosphere from human sources since the start of industrialization, which has caused concerns over potential changes in the global climate. The primary GHGs produced by human activities are carbon dioxide, methane, nitrous oxide, and halocarbons (MMS, 2007a).

The surveying, construction, and decommissioning activities associated with Alternative A would produce GHG emissions. As GHGs are relatively stable in the atmosphere and are essentially uniformly mixed throughout the troposphere and stratosphere, the climatic impact of GHG emissions does not depend upon the source location. Therefore, regional climate impacts are likely a function of global emissions. The causes and effects of climate change can be summarized as follows. First, GHGs are emitted into the atmosphere, causing global warming (i.e., an aggregate average increase in the temperature of the earth's atmosphere). Second, global warming induces the climate to change in disparate ways at various places around the globe, altering global precipitation regimes, decreasing the salinity of the oceans, and altering the seasons. Finally, climate change leads to direct impacts on the environment, such as changes in the structure of an ecosystem, changes in air quality, reduced supply and increased cost of food, warming of polar regions, higher precipitation totals, sea level rise, extreme temperatures, and severe weather events (EPA, 2015). Additionally, uptake of carbon dioxide in marine waters decreases the pH buffering capacity of the ocean.

In general, GHG emissions associated with site characterization surveys and site assessment activities under Alternative A can be assumed to contribute to climate change; however, these contributions would be so small (i.e., 6,990 metric tonnes) compared with the aggregate global emissions of GHGs that they cannot be deemed significant, if their impact could even be detected. The additional GHG emissions anticipated from Alternative A, over the 5-year period, would have a negligible incremental contribution to existing GHG emissions and, therefore, would have an exceedingly **minor** effect on the environment via contributions to climate change.

Water Quality

Water quality in the vicinity of some of the ports, marinas, and coastal estuaries that may be used for proposed action activities (e.g., fabrication, vessel launch) may be subject to cumulative impacts on water quality. For example, Albemarle and Pamlico Sounds are characterized by low levels of chlorophyll-a and dissolved oxygen, and portions of North Carolina coastal shorelines, bays, and estuaries are listed as impaired under the Clean Water Act for mercury, algal growth, metals, organic enrichment/oxygen depletion, pathogens, acidity, and turbidity (EPA, 2012b). Offshore waters where the WEAs are located typically have fewer water quality issues because of ocean circulation and dilutive capabilities, and most water quality degradation originates from onshore sources. There is little risk for fuel spills or collisions/allisions as a result of the proposed action. Therefore, the incremental contribution of the proposed action to cumulative water quality effects is **negligible**.

4.8.3.2 Biological Resources

Birds

Birds in the vicinity of the North Carolina WEAs have historically been, and will continue to be, subject to a variety of anthropogenic stressors, including allisions with manmade structures, commercial and recreational boating activity, pollution, disturbance of marine and coastal environments, hunting, habitat loss of breeding and wintering grounds, and climate change (NABCI, 2011). Migratory birds are affected by similar factors over much broader geographical scales. The proposed action may affect birds through tower allisions, accidental spills, noise disturbances, and other factors. However, because of the short duration of installation and surveying activities and the placement of up to three towers and six buoys over such a large and widespread area, the incremental contribution of the proposed action to cumulative impacts on birds would be **negligible**.

Bats

Bats in the vicinity of the North Carolina WEAs are subject to a variety of anthropogenic stressors including allisions with manmade structures. Hibernating bats have experienced high mortality rates from White Nose Syndrome, which is contributing to an overall decline in North American bat populations, but the bats most affected are not typically bats found in coastal areas (USFWS, 2014). Impacts on bats (e.g., allisions with towers) that could occur as a result of the proposed action are expected to be negligible. Therefore, the proposed action’s incremental contribution to a cumulative impact on bats is considered **negligible**.

Benthic Resources

Benthic resources are affected by ground-disturbing activities on the seafloor. Placement of anchors, piles, and scour protection, and piers, rock rip, and dredging can displace, cover, or smother benthic organisms. Permanent structures such as piles and riprap result in conversion of soft sediment necessary for benthic habitat. Although conversion of soft sediment and benthic habitat is common along the coastline, it is less common offshore where the WEAs are located. In areas of temporary disturbance, benthic resources typically recover in 1 to 3 years. Sediment disturbance and conversion as a result of the proposed action would occur in offshore environments where adjacent and other benthic habitat is plentiful; therefore, the incremental contribution to cumulative effects on benthic resources would be **negligible**.

Marine Mammals

Marine mammals experience a variety of anthropogenic impacts, including collisions with vessels (ship strikes), entanglement with fishing gear, anthropogenic noise, pollution, disturbance of marine and coastal environments, hunting, and climate change. Many marine mammal species migrate long distances and are affected by similar factors over broad geographical scales. Four federally listed marine mammals—fin whale, sei whale, North Atlantic right whale, and humpback whale—all endangered whales, could occur in North Carolina's WEAs. Activities such as increases in vessel traffic associated with the proposed action could provide an incremental contribution to a cumulative effect on marine mammals. Based on the limited area of tower activities (less than 1% of 307,590 acres included in the WEAs) and the fact that activities associated with the proposed action would occur over a 5-year period only, the incremental contribution to this cumulative effect would be **minor**. Additionally, because of the small footprint associated with meteorological tower and buoy placement and the vast area surrounding these small features that is available to North Atlantic right whale cow/calf pairs, the incremental contribution to cumulative effects on the proposed extension of North Atlantic right whale critical habitat would not be significant. The potential impacts on marine mammals from meteorological tower construction would include noise from pile driving construction, loss of water column habitat, and prey abundance and distribution effects. SOCs described in Section 4.4.2.5 and Appendix B that include pile driving restrictions during the migratory season (November 1 to April 30) would help reduce potential incremental contributions to cumulative effects on marine mammals. Meteorological tower installation activities may occur within the WEAs and would require additional consultation with NMFS for potential effects on ESA-listed species. However, with implementation of BOEM's SOCs, the incremental contribution of meteorological tower construction to cumulative effects on marine mammals would be **minor.**

Sea Turtles

Loggerhead turtle, green turtle, hawksbill turtle, Kemp's ridley turtle, and leatherback turtle are federally listed as threatened or endangered under the federal ESA and are all highly migratory species that could occur within, or in the vicinity of, the North Carolina WEAs. Human impacts on sea turtles include collisions with vessels (ship strikes), entanglement with fishing gear, anthropogenic noise, pollution, disturbance of marine and coastal environments, disturbance of nesting habitat, hunting, and climate change. The most likely impact on sea turtles as a result of the proposed action is vessel strikes, which would provide an incremental contribution to cumulative effects on sea turtles. However, because the activities would occur over a 5-year period, with only a limited number of vessels (approximately 718 annually) that would be launched for project activities, with implementation of BOEM SOCs, the incremental contribution would be **minor**. Meteorological tower installation activities may occur within the WEAs and would require additional consultation with NMFS for potential effects on sea turtle species. However, with the implementation of BOEM SOCs, the incremental contribution of meteorological tower construction to cumulative effects on sea turtles would be **minor**.

Finfish and Essential Fish Habitat

Finfish have been affected by anthropogenic effects such as harvesting, pollution, and loss of prey and habitat. Finfish may be affected by proposed action activities including pile driving and tower decommissioning, resulting in impacts related to loss of water column habitat and prey abundance and distribution. It is anticipated that effects related to loss of water column habitat, prey abundance and distribution, and tower decommissioning would result in short-term and temporary behavioral changes only. With implementation of SOCs for pile driving, these effects are anticipated to be insignificant and discountable. Therefore, the incremental contribution to cumulative effects on finfish is **negligible**.

Federally Listed Fish Species

Two federally listed marine fish—smalltooth sawfish (E) and Atlantic sturgeon (E)—could occur in North Carolina's WEAs, because of their current distribution; however, smalltooth sawfish are unlikely to be present because the North Carolina WEAs are north of the species' primary distribution (around Florida). Site characterization activities are not anticipated to contribute to a cumulative effect on listed fish species. Atlantic sturgeon could utilize offshore waters where towers would be constructed. Tower installation activities may occur and would require consultation with NMFS for potential effects on listed fish species. However, with implementation of BOEM SOCs, the incremental contribution of tower construction cumulative effects on listed fish species would be **negligible**.

4.8.3.3 Land Use and Coastal Infrastructure

The proposed action would utilize existing coastal infrastructure and would not expand any facilities. The proposed project would utilize existing navigation channels and would have a negligible effect on vessel traffic. Therefore, the proposed action's cumulative effects on coastal infrastructure and vessel traffic would be **negligible**.

4.8.3.4 Socioeconomic Resources

Cultural Resources

Activities that include disturbance of the seafloor or placement of structures along the shoreline or within the viewshed of the shoreline have resulted in cumulative effects on cultural resources. However, the proposed action requires surveying and avoidance of offshore cultural resources, and the visibility of a meteorological tower in the WEAs is minor. Therefore, the proposed action's contribution to cumulative effects on cultural resources is **negligible**.

Demographics and Employment

The proposed action would result in creation of temporary jobs related to surveying, installation, and monitoring. However, these positions would be temporary and would not provide a perceptible change to employment in the vicinity of the WEAs; therefore, the incremental benefit would be **minor**.

Recreation and Visual Resources

The meteorological towers would appear as thin, faint, vertical lines at the horizon, but would not be expected to adversely affect visual resources (Appendix F). There would be a small incremental contribution to cumulative effects on visual resources as a result of the proposed action because the meteorological tower could be minimally visible; however, this contribution would be **negligible**.

Commercial and Recreational Fisheries

Commercial and recreational fishing activities and recreational boating are expected to continue in the area surrounding the proposed meteorological towers with only temporary exclusion zones during installation activities. Potential for increased fish resources around constructed meteorological towers exists, as they may be an attractant. This in turn could result in increased commercial and recreational fishing opportunities, but these opportunities would not be considered substantive. Commercial and recreational fisheries would not be adversely affected or restricted by the proposed action except briefly during installation, and there would be no incremental contribution to cumulative impacts.

4.8.4 Conclusion

Based on the foregoing information and the scope of this analysis, the proposed action would not result in a substantive incremental contribution to cumulative effects on any resources discussed in this EA.

5. CONSULTATION AND COORDINATION

5.1 Public Involvement

BOEM held two public information meetings in January 2013 in Nags Head and Wilmington, NC, as well as four visual simulation open houses in January and August 2013 in Kitty Hawk, Wilmington, Southport, and Carolina Shores, NC. BOEM also held four NC Task Force meetings throughout the state to engage several stakeholders, including USCG, NPS, and NMFS. Discussion topics included vessel traffic data, maritime concerns, fisheries, habitats, and visual impacts.

5.1.1 Notice of Intent

On December 13, 2012, BOEM published in the FR the NOI to prepare an EA for the Commercial Wind Leasing and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina (77 FR 74218). Input on issues and alternatives to be analyzed in the EA were solicited. BOEM accepted comments until January 28, 2013. The original comment period deadline was extended to March 7, 2013. A total of 47 comments were received during the 60-day comment period. Many of the commenters, including NPS, Sierra Club, National Wildlife Federation, and the Nature Conservancy, raised concerns about the proposed action's proximity to North Atlantic right whale calving grounds, effects of noise, possible vessel strikes, seasonal residency, migratory corridor, and current designated critical habitat and proposed expansion of the critical habitat of the North Atlantic right whale. NPS submitted comments that raised concerns about the impact of nighttime lighting on night sky quality as a result of constructing a meteorological tower. Included in those concerns were light color that may disorient sea turtles and birds, strobe and flash lighting, and light intensity. Other issues identified to be analyzed included:

- Analysis of the potential harmful effects of wind power generation on birds and other fauna that depend upon the offshore ecosystem;
- Engaging the communities of Kitty Hawk, Nags Head, Wilmington, Southport, and Carolina Shores in a dialogue about the BOEM process and offshore wind energy;
- Setting ship speed limits;
- Defining best management practices for data collection configuration (DCC) construction;
- Incorporating mitigation efforts in a lease agreement;
- Conducting full assessments for each of the OCS blocks for full deployment of both a DCC and a buoy (buoy DCC) in each block;
- Improving stakeholder outreach;
- Analyzing impacts of proposed actions on other endangered marine mammals; and
- Analyzing the effect on marine mammals of the size of the boats necessary for construction.

The comments can be viewed at http://www.regulations.gov by searching for docket ID BOEM-2012-0090.

5.1.2 Notice of Availability

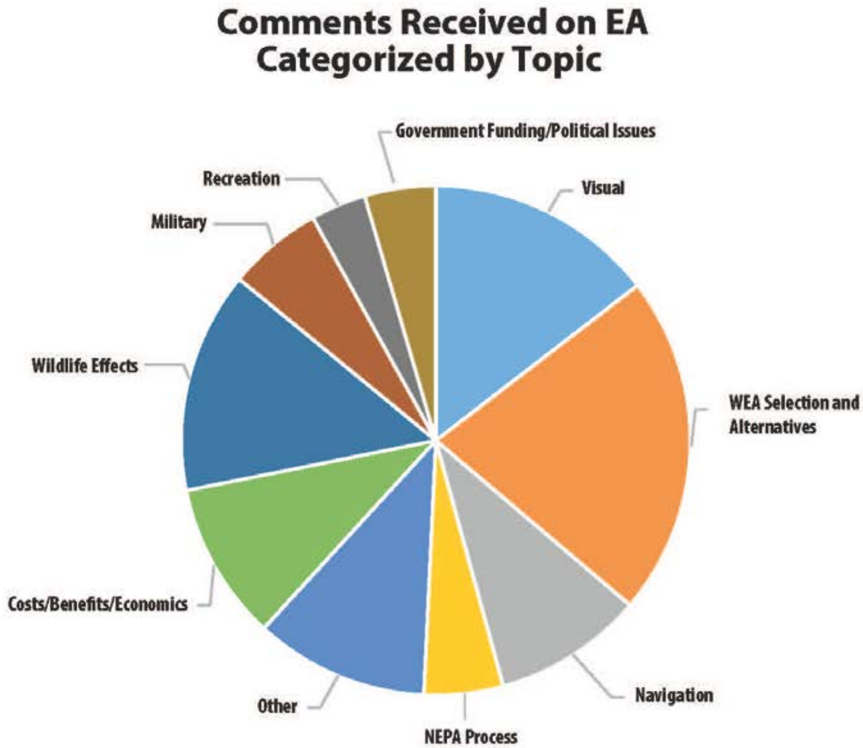
On January 23, 2015, BOEM published in the FR the NOA for the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina EA (OCS EIS/EA BOEM 2015-009 [80 FR 3621]), indicating the start of the 30-day comment period for the EA. The EA was made available to the public on BOEM's website during this period, and comments were due by February 23, 2015. BOEM also conducted three public meetings in North Carolina during the public comment period:

- February 9, 2015, Kitty Hawk, NC;
- February 11, 2015, Wilmington, NC; and
- February 12, 2015, Carolina Shores, NC.

5.1.3 Comments on the EA

A total of 199 written comments were received from individuals, municipalities, agencies, and nongovernmental organizations via Internet submission, regular mail, or during one of the three public meetings. Of the 199, 130 comments offered support for investigation and development of renewable energy and future development of commercial-scale wind facilities in North Carolina (a few of the 130 support letters also expressed concerns over wildlife or other issues, which are addressed below in Section 5.1.3.1). The remaining 69 comments expressed opposition to, or specific concerns related mainly to, the potential development of commercial-scale wind facilities in WEAs offshore North Carolina. Comments were reviewed individually regardless of whether they expressed support, opposition, or concerns only over certain aspects of the proposed action. Approximately 182 discrete issues or topics were identified in the letters, many of which expressed the same or similar concerns. In cases where there were multiple topics in one letter, each topic was identified and grouped with other similar comments. The greatest number of comments received related to WEA selection and alternatives (see chart below), followed by visual, wildlife (including threatened and endangered species), and costs/benefits/economics, all of which received about the same number of comments.

A great number of the concerns expressed by commenters were related to the construction and operation of a commercial-scale wind facility. As discussed in Section 1.4.2, *Scope of Analysis*, installation, construction, and operation of a full-scale wind energy facility are outside the scope of the analysis for the proposed action in this EA. If the North Carolina WEAs are leased and BOEM receives a COP proposing the construction and operation of a commercial wind energy facility, BOEM will consider the effects of these activities, including visual impacts, through a project-specific NEPA analysis that would likely take the form of an EIS and would provide additional opportunities for public involvement.



The list of individuals, nongovernmental organizations, municipalities, and agencies that submitted comments is provided below in Table 5-1. The table provides a column with numbers that correspond to topic areas (Sections 1 through 10) identified within a comment letter.

In response to comments, BOEM has revised the EA to provide additional information related to the WEA planning process in Section 1.6.1.1. BOEM has also included new information in this revised EA. This includes the proposed rule to expand critical habitat for North Atlantic right whales in the North Atlantic (adding two new areas that overlap with the Wilmington West WEA and a small portion of the Wilmington East WEA), which was published by NMFS while the EA was available for public comment (80 FR 9314). The EA has been revised to include an analysis in Section 4.4.2.5 of potential effects on the proposed North Atlantic right whale critical habitat. Appendix B has been updated to reflect modifications to the SOCs for the purpose of clarification, as identified during BOEM's work on the New Jersey Final Sale Notice and as a result of ESA consultations with NMFS on the Virginia Offshore Wind Technology Advancement Project.

Table 5-1
List of Commenters on BOEM NC EA

Comment ID #	Commenter Name	Organization/ Agency	Organization/ Agency Type	Response Location
1	Maureen Welch			
2	Frank Robinson			See Comment Response in Section 3, *Wildlife Effects*; Section 1, *Costs/Benefits/Economics*; and Section 2, *Government Funding/Political Issues*.
3	Jeannine Meyers			
4	Matthew Werner			See Comment Response in Section 5, *WEA Selection and Alternatives*.
5	Jesse Hunter			
6	Craig Harms			
7	Hazel Poolos			
8	Keith Cutler			
9	Steve Smith			
10	Les Kersey			See Comment Response in Section 2, *Government Funding/Political Issues*.
11	Susan Dineen			See Comment Response in Section 1, *Costs/Benefits/Economics*.
12	Stan Young			See Comment Response in Section 1, *Costs/Benefits/Economics*; Section 2, *Government Funding/Political Issues*; and Section 8, *Military*.
13	Chuck Rietz			See Comment Response in Section 1, *Costs/Benefits/Economics*.
14	John Rhodes			See Comment Response in Section 1, *Costs/Benefits/Economics*.

Comment ID #	Commenter Name	Organization/ Agency	Organization/ Agency Type	Response Location
15	Richard Berryman			See Comment Response in Section 1, *Costs/Benefits/Economics*, and Section 4, *Visual*.
16	Brenda Quanstrom			See Comment Response in Section 2, *Government Funding/Political Issues*, and Section 10, *Other*.
17	Robin Comer			See Comment Response in Section 2, *Government Funding/Political Issues*.
18	Cynthia Hermans			
19	Herman Dantzler			
20	Stephen Greig			See Comment Response in Section 5, *WEA Selection and Alternatives*.
21	Regina O'Donnell			
22	Theodore Passalis			See Comment Response in Section 1, *Costs/Benefits/Economics*.
23	Lora Sharkey			
24	Renee Gledhill-Earley	North Carolina State Historic Preservation Office	State	
25	Jodi Mills			
26	Marty Aden			
27	Erica Grantmyre			See Comment Response in Section 3, *Wildlife Effects*.
28	Stephen Greig			See Comment Response in Section 5, *WEA Selection and Alternatives*.
29	Janet Hosey			See Comment Response in Section 3, *Wildlife Effects*.

Comment ID #	Commenter Name	Organization/ Agency	Organization/ Agency Type	Response Location
30	Richard Jones			
31	Maggie Clark			
32	Herman Hall			
33	Michael Morse			
34	John Csernecky			
35	Shawn O'Neill			
36	Barbara Marrow			
37	James Robinson-Long			
38	Starr Watson Watson			
39	Jacquelyn Acha			
40	Timothy McGlinn			
41	Gail Livingston			
42	Chris McGratty			
43	Gena Hall			
44	Melody Stickney			
45	Judi Scharns			
46	Geoffrey Santoliquido			See Comment Response in Section 3, *Wildlife Effects*.
47	Nancy Thomas			
48	Cynthia Strain			
49	L Snyder			
50	Donna Reeve			
51	Barbara Lutz Hart			

Comment ID #	Commenter Name	Organization/ Agency	Organization/ Agency Type	Response Location
52	Andy McGlinn			
53	Janet McGlinn			
54	John Lott			
55	Nancy Taylor			
56	Geoffrey Santoliquido			See Comment Response in Section 3, *Wildlife Effects*.
57	Brian Glover			
58	Allison Parker			
59	Olga Pader			
60	Rebecca Whitson			
61	Valerie Willis			
62	Elizabeth Hopp			
63	Sally Petty			
64	Pamela Quattrini			
65	Karen Gray			
66	Grant Stewart			
67	Connie Johnson			
68	Josh London			
69	Sarah Charles			
70	Charles Dockery			
71	Jill Young			
72	Phillip Pittman			

Comment ID #	Commenter Name	Organization/ Agency	Organization/ Agency Type	Response Location
73	Michael Rice	Save the Cape, Inc.	Environmental Group	See Comment Response in Section 1, *Costs/Benefits/Economics*; Section 4, *Visual*; Section 3, *Wildlife Effects*; and Section 6, *NEPA Process*.
74	Amy Driver			See Comment Response in Section 2, *Government Funding/Political Issues*.
75	JC Honeycutt			
76	John Droz	Alliance for Wise Energy Decisions	Environmental Group	See Comment Response in Section 1, *Costs/Benefits/Economics*; Section 5, *WEA Selection and Alternatives*; and Section 2, *Government Funding/Political Issues*.
77	Frank Jordan			
78	Robert Kivett			
79	Tammy Hitchcock			
80	Susan Lozaga			
81	Rex Riley			
82	Eloise Grathwohl			
83	Joel Schon			
84	Peter Crow			
85	Regina Uribe			
86	Iris Dethmers			
87	Deborah Ahlers	Town of Caswell Beach	Local	See Comment Response in Section 1, *Costs/Benefits/Economics*; Section 3, *Wildlife Effects*; Section 10, *Other*; and Section 4, *Visual*.
88	Millie Hyman			
89	Martha Taylor			

Comment ID #	Commenter Name	Organization/ Agency	Organization/ Agency Type	Response Location
90	Sherry Eason			
91	Stephen Terrio			
92	Harrison Curtis			
93	Dori Whatley			
94	Judy Parsons			
95	Valerie Rabeler			
96	Susan Baker			
97	Susan White			
98	Mac Montgomery			
99	Deidra Smith			
100	Daniel Naber			
101	Sharon Shaner			
102	Cara Muglia			
103	Katherine Roellgen			
104	Bev Veals			
105	Thomas Bader			
106	Debra Ayers			
107	Sue Kemp			
108	Stephen Melott			
109	Andrew Schuch			
110	Henry Croom			
111	Alexander Joyce			
112	Rose Shulman			
113	Peter Hatch			
114	Lea Blackwood			

Comment ID #	Commenter Name	Organization/ Agency	Organization/ Agency Type	Response Location
115	Mary Holst			
116	Pat Harms			
117	Claudia Townsend			
118	Penny Hooper			
119	Robert Holst	Re-eco Design	Business	
120	Mindy Robinson			
121	Douglas Ruegg			See Comment Response in Section 2, *Government Funding/Political Issues*.
122	Jessica Ruegg			
123	Grant Bailey			
124	Sandra Campbell			
125	Melanie Restall			
126	Clark Milioti			See Comment Response in Section 3, *Wildlife Effects*; Section 10, *Other*; Section 4, *Visual*; Section 1, *Costs/Benefits/Economics*; and Section 2, *Government Funding/Political Issues*.
127	Ernest Eich			
128	Russ Berkoben			See Comment Response in Section 5, *WEA Selection and Alternatives*; Section 9, *Tourism and Recreation*; Section 7, *Navigation*; Section 8, *Military*; and Section 10, *Other*.
129	Tal Galton			
130	David Durack			See Comment Response in Section 4, *Visual*; Section 7, *Navigation*; and Section 5, *WEA Selection and Alternatives*.

Comment ID #	Commenter Name	Organization/ Agency	Organization/ Agency Type	Response Location
131	Chris Anson			See Comment Response in Section 4, *Visual*; Section 7, *Navigation*; Section 8, *Military*; Section 10, *Other*; and Section 5, *WEA Selection and Alternatives*.
132	Lola Faircloth			
133	Frank Overton			See Comment Response in Section 5, *WEA Selection and Alternatives*.
134	Wendy Shedd			
135	Glassell Fitz-Hugh			See Comment Response in Section 5, *WEA Selection and Alternatives*; Section 7, *Navigation*; Section 8, *Military*; and Section 10, *Other*.
136	Robert Liesegang			
137	Sallie Abbas			
138	Michael Smith			See Comment Response in Section 4, *Visual*; Section 5, *WEA Selection and Alternatives*; Section 7, *Navigation*; Section 8, *Military*; and Section 10, *Other*.
139	Sam Whitley			
140	Carl Melle			
141	Joan Guilkey			See Comment Response in Section 4, *Visual*; Section 5, *WEA Selection and Alternatives*; Section 9, *Tourism and Recreation*; and Section 8, *Military*.
142	Donna Kerpelman			See Comment Response in Section 4, *Visual*; Section 5, *WEA Selection and Alternatives*; Section 7, *Navigation*; and Section 8, *Military*.
143	Donna Jarmusz			See Comment Response in Section 5, *WEA Selection and Alternatives*.

Comment ID #	Commenter Name	Organization/ Agency	Organization/ Agency Type	Response Location
144	Joseph Makar			See Comment Response in Section 4, *Visual*.
145	Chris McCall	Village of Bald Head Island	Local	See Comment Response in Section 6, *NEPA Process*, and Section 5, *WEA Selection and Alternatives*.
146	Ryan Garrott			
147	Eliza Root			
148	Anne Gardner			See Comment Response in Section 4, *Visual*; Section 5, *WEA Selection and Alternatives*; Section 7, *Navigation*; and Section 8, *Military*.
149	Rita Pelczar			
150	Jack Gartner			See Comment Response in Section 7, *Navigation*.
151	Bruce Hovermale			See Comment Response in Section 3, W*ildlife Effects*.
152	Lillian Carter			See Comment Response in Section 4, *Visual*; Section 5, *WEA Selection and Alternatives*; Section 7, *Navigation*; and Section 8, *Military*.
153	Justin Husted			
154	Shane Staples	North Carolina Division of Coastal Management	State	See Comment Response in Section 3, *Wildlife Effects*, and Section 9, *Tourism and Recreation*.
155	Helen GP			
156	Alan Womack			
157	Margie Stephenson	Brunswick County	Local	See Comment Response in Section 1, *Costs/Benefits/Economics*; Section 10, *Other*; Section 9, *Tourism and Recreation*; and Section 3, *Wildlife Effects*.

Comment ID #	Commenter Name	Organization/ Agency	Organization/ Agency Type	Response Location
158	Dave Harrah			See Comment Response in Section 10, *Other*; Section 1, *Costs/Benefits/Economics*; Section 4, *Visual*; Section 7, *Navigation*; and Section 3, *Wildlife Effects*.
159	Betty Wallace	Town of Oak Island	Local	See Comment Response in Section 3, *Wildlife Effects*; Section 10, *Other*; Section 9, *Tourism and Recreation*; Section 7, *Navigation*; Section 1, *Costs/Benefits/Economics*; and Section 4, *Visual*.
160	Franklin Klaine			See Comment Response in Section 6, *NEPA Process*; Section 4, *Visual*; Section 7, *Navigation*; and Section 3, *Wildlife Effects*.
161	Tiffany Keenan-Bateman			See Comment Response in Section 3, *Wildlife Effects*.
162	Anonymous			See Comment Response in Section 10, *Other*.
163	Donnie Meekins			
164	Patti Ulirsch			
165	Reuben Gelblum			
166	Lori Sharp			
167	Jeanine Crum			
168	Annette Hudson			
169	Joe Hawkins			See Comment Response in Section 4, *Visual*; Section 7, *Navigation*; and Section 5, *WEA Selection and Alternatives*.
170	Jenny Kelvington	NC Department of Environment and Natural Resources	State	See Comment Response in Section 5, *WEA Selection and Alternatives*; Section 9, *Tourism and Recreation*; Section 6, *NEPA Process*; and Section 7, *Navigation*.

Comment ID #	Commenter Name	Organization/ Agency	Organization/ Agency Type	Response Location
171	Andrew Menaquale	Oceana	Environmental Group	See Comment Response in Section 5, *WEA Selection and Alternatives*, and Section 3, *Wildlife Effects*.
172	Judith Beckley			
173	Giles King			
174	Rebecca Lent	Marine Mammal Commission	Federal	See Comment Response in Section 5, *WEA Selection and Alternatives*, and Section 3, *Wildlife Effects*.
175	John Harms	American Waterways Operators	Trade Association	
176	Evan Auld			
177	Audrey Hogan			
178	Curtis Smalling	Audubon North Carolina	Environmental Group	See Comment Response in Section 3, *Wildlife Effects*, and Section 6, *NEPA Process*.
179	Kit Adcock	Bald Head Association/ BHI Stage II Association	Homeowners Association	See Comment Response in Section 4, *Visual*; Section 1, *Costs/Benefits/Economics*; Section 9, *Tourism and Recreation*; Section 5, *WEA Selection and Alternatives*; Section 7, *Navigation*; Section 10, *Other*; Section 8, *Military*; and Section 3, *Wildlife Effects*.
180	Chris Carnevale	Southern Alliance for Clean Energy	Environmental Group	See Comment Response in Section 5, *WEA Selection and Alternatives*; Section 4, *Visual*; Section 7, *Navigation*; and Section 10, *Other*.
181	Pamela Benbow			

Comment ID #	Commenter Name	Organization/ Agency	Organization/ Agency Type	Response Location
182	Sierra Weaver	Southern Environmental Law Center	Environmental Group	See Comment Response in Section 5, *WEA Selection and Alternatives*; Section 6, *NEPA Process*; Section 3, *Wildlife Effects*; Section 1, *Costs/Benefits/Economics*; Section 4, *Visual*; and Section 7, *Navigation*.
183	Brian O'Hara	Southeastern Wind Coalition	Environmental Group	See Comment Response in Section 4, *Visual*; Section 5, *WEA Selection and Alternatives*; and Section 1, *Costs/Benefits/Economics*.
184	Tammy Hanson			
185	Adrienne Moore			
186	Nancy Mathis			See Comment Response in Section 4, *Visual*; Section 5, *WEA Selection and Alternatives*; Section 7, *Navigation*; Section 8, *Military*; and Section 10, *Other*.
187	Shawn Maher			See Comment Response in Section 4, *Visual*; Section 5, *WEA Selection and Alternatives*; Section 7, *Navigation*; Section 8, *Military*; and Section 10, Other.
188	Charles Ruland			See Comment Response in Section 4, *Visual*, and Section 5, *WEA Selection and Alternatives*.
189	Edwin Cox			
190	Karen Mortimer			See Comment Response in Section 5, *WEA Selection and Alternatives*.
191	Jim Lyons			
192	M.S. Medeiros, Jr.			
193	Patricia Montanio	NOAA	Federal	See Comment Response in Section 10, *Other*, and Section 3, *Wildlife Effects*.

Comment ID #	Commenter Name	Organization/ Agency	Organization/ Agency Type	Response Location
194	Larry and Robin Roper			
195	David Eastburn			See Comment Response in Section 6, *NEPA Process*; Section 10, *Other*; Section 4, *Visual*; and Section 1, *Costs/Benefits/Economics*.
196	Chris J. Wade		Public Hearing	See Comment Response in Section 3, *Wildlife Effects*.
197	Roger D. Shew		Public Hearing	See Comment Response in Section 3, *Wildlife Effects*.
198	Earl Keel		Public Hearing	
199	Mayor, Ron Watts	Town of Sunset Beach	Public Hearing	See Comment Response in Section 4, *Visual*; Section 1, *Costs/Benefits/Economics*; Section 3, *Wildlife Effects*; and Section 5, *WEA Selection and Alternatives*.

5.1.3.1 Summary of Comments and BOEM Responses

Responses to comments are presented in italicized text below the summary of comments received.

Section 1. Costs/Benefits/Economics

BOEM received comments regarding the economic viability of wind energy. Commenters indicated that the costs of generating wind energy are high, which would increase energy costs to the consumer. They also speculated that there would be limited benefit to society and low return on investment. BOEM also received comments that questioned the increasing cost associated with moving WEAs farther offshore. (Note: Comments related to a decrease in property values due to visual effects are addressed below in Section 4, *Visual*.)

The Energy Policy Act of 2005 requires BOEM to obtain a fair return to the United States for renewable energy leases and grants issued for use of the federal OCS. As part of our NEPA responsibilities, BOEM examines the environmental and social consequences of our decisions. For this EA, the decision is related to offering leases and subsequent assessment of the resource (e.g., wind speed, ocean floor sediment, mammal and bird usage) by the lessee. Our economic responsibilities are focused more on the social impacts on existing users of resources (e.g., port access, available housing for transient workers) and marine-related employment, such as fishing and tourism jobs. During this preliminary stage of wind energy development, there are negligible socioeconomic impacts. BOEM may review cost and revenue impacts in the context of comparing alternatives, but only in terms of assessing the economic element of technically feasible options. The water depth of the proposed lease meets the requirements of commercially available foundations.

Our regulations do not require developers to provide BOEM with any cost or revenue information. Additionally, the complexity, uncertainty, and volatility of the energy market require the use of sophisticated models to determine the economic viability of proposed projects, which is beyond our NEPA responsibilities. Instead, a state's public utilities commission is responsible for judging the benefits of a project (e.g., reduced air pollution, improved energy security, local job creation) against any adjustments in electricity prices through approval of power purchase agreements. In 2007, North Carolina adopted a renewable energy portfolio standard that requires, by 2021, that 12.5% of investor-owned utility retail electric sales come from renewable energy resources. The law also created a mechanism by which utilities can recover the incremental cost of power from renewable sources, which is subject to a capped amount.

Section 2. Government Funding/Political Issues

BOEM received comments that questioned the use of government funds for wind energy and suggested that wind energy development is the result of lobbying and political interests.

The Energy Policy Act of 2005 requires BOEM to obtain a fair return to the United States for renewable energy leases and grants issued for use of the federal OCS. Both federal and state *initiatives and policies have been enacted in recent years to encourage and increase renewable energy development in the U.S. The "Smart from the Start" Atlantic Wind Energy Initiative was announced in 2010 by Secretary of the Interior Ken Salazar to facilitate the responsible development of wind energy on the Atlantic OCS. This initiative calls for the identification of areas of the Atlantic OCS that appear most suitable for commercial wind energy activities and present the fewest apparent environmental and user conflicts. Similar to other states in the U.S. North Carolina adopted a renewable energy portfolio standard in 2007 that requires 12.5% of investor-owned utility retail electric sales to come from renewable energy resources by 2021.*

Section 3. Wildlife

BOEM received comments that indicate that the effects from the full lifecycle of wind energy implementation in North Carolina, including construction and operation of a commercial-scale wind energy facility, were not included in the analysis but are necessary because there could be significant effects on wildlife. BOEM also received comments that suggest that various alternatives should be selected to reduce potential effects on species, particularly North Atlantic right whales, during migration.

Effects from installation, construction, and operation of a full-scale wind energy facility are outside the scope of the analysis for the proposed action (see Section 1.4.2, Scope of Analysis*) and, therefore, are not addressed in the wildlife sub-categories below. Effects associated with site assessment and site characterization activities are the focus of this EA and include multiple actions that are intended to assess the distribution and population density of birds, benthic organisms, bats, and marine fauna and to aid a future NEPA analysis for a wind energy facility in the event a developer proposes one (see Table 3-4 and Sections 3.2.1.3 through 3.2.1.7).*

The purpose of this NEPA analysis is to identify potential effects on resources, including wildlife species, from the proposed action and alternatives. This has been completed with use of an EA. To finalize an EA, BOEM has to make a determination that no significant effects would occur and issue a Finding of No Significant Impact (FONSI) or a mitigated FONSI. The analysis contained in this EA indicates that the proposed action, including all of the alternatives and SOCs, would not result in significant effects on wildlife or their habitats, including North Atlantic right whales. While the draft EA was being circulated for public comment, NMFS proposed a new rule to extend the current critical habitat for North Atlantic right whales (NMFS, February 20, 2015, 80 FR 9314). Section 4.4.2.5 of this revised EA has been updated and includes additional analysis of potential effects on this proposed extension of critical habitat for North Atlantic right whales.

Marine Mammals (including North Atlantic right whales)

Data gathered as part of site characterization would be used in a future NEPA analysis for a commercial-scale wind energy facility should a lessee propose one. Site assessment and site characterization activities may include aerial and/or vessel surveys for marine mammals (Section 3.2.1.7 and Table 3-4). The proposed action activities include implementation of SOCs for marine mammals (Section 4.4.2.5) and additional SOCs (Appendix B) to reduce potential effects on marine mammals. These measures include speed reductions for all vessels in Dynamic Management Areas and Seasonal Management areas and for vessels 65 feet in length, or longer, *in the proposed action area from November 1 to April 30; NMFS-approved protected species observers; establishment and monitoring of exclusion zones; and "soft start" and shutdown procedures. The analysis determined that effects on marine mammals would be negligible to minor for most site assessment and site characterization activities, with the exception of pile driving effects on marine mammals and potential North Atlantic right whale vessel strikes. Pile driving could result in moderate effects on marine mammals but would not be conducted from November 1 to April 30, the time when North Atlantic right whales are more likely to be present in the proposed action area. Because of the limited number of piles needed (i.e., three piles in an area of more than 307,000 acres), the short time needed for pile installation, the mobile nature of marine mammals, and the implementation of SOCs to minimize impacts on marine mammals, the potential for acoustic effects to occur at a moderate level is relatively small. In addition, if a lessee were to propose any pile driving activities in their SAP, project-specific ESA Section 7 consultations would be required. Project-related vessel traffic is not anticipated to add significantly to existing vessel traffic in the area, and adherence to vessel strike avoidance measures and seasonal speed restrictions is anticipated to reduce any possible vessel collisions with whales to minor levels. This revised EA contains updated SOCs for marine protected species based on ESA consultations with NMFS for the Virginia Offshore Wind Technology Advancement Project.*

Proposed Extension of North Atlantic Right Whale Critical Habitat

The extension of North Atlantic right whale critical habitat was proposed by NMFS on February 20, 2015, while the draft EA was available for public comment. Therefore, an analysis of potential effects on critical habitat was not included in the draft EA. In light of issuance of the proposed rule, BOEM has added an analysis in Section 4.4.2.5 of this revised EA. Based on the short duration of the proposed action, the small footprint of the meteorological towers and buoys, and adherence to SOCs for all project-related vessels, it is not anticipated that the proposed action would alter North Atlantic right whale behavior over the long term or fragment critical habitat.

Birds

The EA has also been updated to include new scientific information from Normandeau (2014) on passerine migrants. In addition, the EA has been updated to include list of marine bird species found during previous surveys of the Wilmington East and West WEAs.

The effects associated with site assessment and site characterization activities are the focus of this EA. The proposed action includes surveys for migratory and other birds (Section 3.2.1.5, Avian Resource Surveys*, and Table 3-4,* Biological Survey Types and Methods*). Information from avian surveys conducted as part of the proposed action would be used to inform future NEPA analyses for determining potential effects on avian species should a commercial-scale wind energy facility be proposed (see guidelines for providing avian information: http://www.boem.gov/uploadedFiles/BOEM/Renewable_Energy_Program/Regulatory_Information/Avian%20Survey%20Guidelines.pdf). The proposed action covers offshore activities and not onshore activities. If the leaseholder submits a COP, the onshore activities will be analyzed under NEPA. If the proposed cable landfall in the COP crosses sensitive habitats, BOEM may* *require additional information and inclusion of mitigation to avoid or minimize negative impacts on sensitive species and their habitats.*

Sea Turtles

An analysis of effects on sea turtles, including the loggerhead sea turtle (federally listed as threatened), related to lease issuance and site characterization (including meteorological buoys) is described in the NMFS G&G BO (NMFS, 2013a). The analysis in the NMFS G&G BO determined that G&G activities—including acoustic sound sources, vessel and equipment noise, vessel traffic, trash and debris release, and accidental fuel spills that may occur as a result of G&G activities—were not likely to result in reductions in the reproduction, numbers, or distribution of sea turtle populations or appreciably reduce the likelihood of green, hawksbill, Kemp's ridley, leatherback, or Northwest Atlantic loggerhead sea turtles surviving and recovering in the wild (NMFS, 2013a).

In addition, an analysis of site assessment activities was conducted as part of the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina, South Carolina, and Georgia Biological Assessment *(BOEM, 2014b). The analysis in the BA concluded that sea turtles could experience potential effects related to pile driving, loss of water column habitat, prey abundance and distribution, and tower decommissioning but that these effects would be temporary, insignificant, and discountable. BOEM's analysis concluded that pile driving noise could be detectable by sea turtles at low frequencies; if sea turtles were to be close enough to the sound source, the potential for injury could exist. This impact would be moderate. However, it is highly unlikely that this would happen because of the required SOCs pertaining to a 3,281-foot (1,000-meter) exclusion zone, the 60-minute "all clear" period for pile driving, and the short-term nature of pile driving activities (i.e., 4 to 8 hours per day over 3 days for each tower). However, given the larger area of ensonification that results from pile driving and the known occurrences of sea turtles throughout the coastal waters of North Carolina, it can be reasonably assumed that some sea turtles may experience minor behavioral effects during exposure to disturbing/harassing levels of noise beyond the 3,281-foot (1,000-meter) exclusion zone.*

None of the WEAs overlap with NMFS-designated critical habitat for loggerhead sea turtles, which are federally listed as threatened (79 FR 39856). Although BOEM's analysis in this revised EA determined that PCEs for migratory habitat could be affected if construction of the meteorological towers alters habitat that is needed for efficient passage, the area that would be displaced by towers would be a small fraction of the entire migratory pathway to offshore Sargassum *habitat, and no significant physical barriers to migration would result from the proposed action. Noise associated with construction of a meteorological tower would be localized and temporary, lasting no more than 3 days. Furthermore, the meteorological towers would be removed no later than 2 years after the cancellation, expiration, relinquishment, or other termination of the lease. Construction of meteorological towers is not anticipated to affect any PCEs for* Sargassum *or winter habitat because it would not result in physical harvest or pollution of* Sargassum *or changes in water temperature, respectively. Therefore, it is highly unlikely that this PCE would be significantly affected. This habitat would not experience adverse modification.*

All survey plans received by BOEM will be reviewed by BOEM to ensure that the plans are wholly consistent with the activities covered under existing consultation. For activities not covered (e.g., meteorological tower construction), BOEM will initiate consultation with NMFS in accordance with Section 7 of the ESA and plan approval would not occur until consultations have been concluded.

Finfish and Fisheries

The EA determined that all effects on fisheries as a result of the proposed action would be negligible (Section 4.4.4.5) and negligible to minor for finfish and federally listed smalltooth sawfish and Atlantic sturgeon (Section 4.4.2.7). In its comment letter for this EA dated February 23, 2015, NMFS indicated that it appreciated the efforts BOEM has made with respect to EFH and had no further comments related to that topic for this EA. The South Atlantic Fishery Management Council (SAFMC) is in the process of developing Special Management Zones (SMZs) for snapper and grouper spawning areas, referred to as the Visioning Project: Planning for the Future of the Snapper Grouper Fishery *(SAFMC, 2015). According to the SAFMC report issued in February 2015, that process is currently in the public review phase; the final version of the SMZs is anticipated in December 2015. The SAFMC public hearing document for Amendment 36 has several proposed areas. The ones off the coast of North Carolina do not overlap with proposed WEAs and range from 50 meters to 100 meters in depth. Given the analysis in the EA related to fish and fisheries and the determination that effects on commercial and recreational fishing would be negligible because of the short-term nature of construction activities, along with the small footprint necessary for each of the meteorological towers and the availability of other locales for fishing, it is unlikely that the proposed action would have an adverse effect on SMZs were they to overlap or be adjacent to WEA boundaries.*

BOEM received a comment that indicated that it was difficult to follow the analysis of effects on wildlife because of the reliance on other BOEM documents (e.g., G&G Final PEIS [BOEM, 2014a], BOEM BA). The commenter requested that effects from leasing on all wildlife on the OCS be included in one single document. The comment further stated that it was not permissible to rely on protective measures for species that were developed for other activities in other contexts that could be modified.

BOEM relied on existing documentation, in accordance with 40 CFR Section 1502.21, which states that:

> Agencies shall incorporate material into an environmental impact statement by reference when the effect will be to cut down on bulk without impeding agency and public review of the action. The incorporated material shall be cited in the statement and its content briefly described.

All of the documents that were relied upon for the analysis in this EA are readily available for public review and relevant based on geographic scope, type of activity, or both.

Section 4. Visual

BOEM received numerous comments that expressed concern over the visual effects that offshore wind turbines would have on onshore viewsheds, particularly those associated with Bald Head Island, Bald Head Island Lighthouse (including its historic value), and Oak Island Lighthouse. Concern was also raised regarding dark sky effects and the use of traditional light sources (e.g., non-LED) on wind turbines.

Effects from the installation, construction, and operation of a full-scale wind energy facility are outside the scope of the analysis for the proposed action (see Section 1.4.2, Scope of Analysis*). Effects associated with site assessment and site characterization activities are the focus of this EA. Effects on visual resources in the affected area, including the Bald Head Island Lighthouse, from the proposed action would be negligible or negligible to minor (see Sections 4.4.4.1,* Cultural and Historic Resources*; 4.4.4.4,* Recreation and Tourism*; 4.4.4.5,* Commercial and Recreational Fisheries*; and 4.4.4.6,* Visual Resources*).*

As discussed in Section 4.4.4.6, Visual Resources*, two of the viewpoints (#1 and #4 [see Table 4-15]) were intentionally selected to allow for evaluation of the effect of viewer elevation on the potential visibility and perceived scale of the meteorological towers. Visual effects were determined to be negligible from both shoreline viewpoints and elevated viewpoints.*

If the North Carolina WEAs are leased and BOEM receives a COP proposing the construction and operation of a commercial wind energy facility, BOEM will consider the effects of these activities, including visual impacts, through a project-specific NEPA analysis and though the initiation of other consultations (e.g., NHPA). This would most likely take the form of an EIS and would provide additional opportunities for public involvement. As with a SAP, BOEM may approve, approve with modification, or disapprove a lessee's COP.

BOEM received a comment that suggested that the setback for Kitty Hawk could be decreased without incurring adverse visual effects.

During the area identification process, BOEM reduced the size of the Kitty Hawk Call Area to ensure navigational safety and reduce visual impacts, particularly on the Bodie Island Lighthouse. The setback distance for the Bodie Island Lighthouse came from a request by NPS. BOEM worked closely with USCG and maritime stakeholders to avoid impacts on navigational safety.

Visual impacts from the installation of a meteorological tower and/or meteorological buoys were analyzed in this EA. Visual impacts from the installation of a wind energy facility were not analyzed. If a lessee were to submit a COP, BOEM would conduct a full environmental review, which would include a full analysis of visual impacts from a wind energy facility. This would include project-specific visual simulations. The visibility of offshore wind facilities is dependent on a number of factors, including distance from shore, height of the turbines, elevation of the viewer, atmospheric conditions, human visual acuity, and sea state.

BOEM received a comment that indicated that the visual analysis did not adequately analyze visual effects from the shorelines of the South Brunswick Islands.

Appendix F of the EA includes eight visual simulations of the meteorological tower from Sunset Beach Pier and eight from Bald Head Island. The EA determined that visual effects from placement of the meteorological towers in all three WEAs, including Wilmington West, which is the nearest location to Sunset Beach, and Bald Head Island, were negligible. As depicted in the visual simulation, the meteorological tower is almost indiscernible from the Sunset Beach Pier and Bald Head Island. Visibility of the meteorological tower from shoreline areas between these two locations would be more or less equivalent to the condition depicted in Appendix F for Sunset Beach and Bald Head Island. Therefore, the effect would be negligible.

Section 5. WEA Selection and Alternatives

BOEM received comments regarding the WEAs and alternatives, including suggestions that BOEM consider revising the WEA boundaries and modifying the alternatives to the proposed action. Several commenters indicated their support for, or opposition to, individual alternatives.

The North Carolina WEAs were identified through the area identification process, which seeks to delineate areas that are suitable for wind energy development while removing conflicts with wildlife and existing human use. Additional information on the development of the NC WEAs can be found in Section 1.6.1.1.

Comments requesting modifications to, or selection of, certain alternatives based on concerns over commercial development are outside the scope of the analysis for the proposed action (see Section 1.4.2, Scope of Analysis*). In the event that a commercial-scale wind energy facility is proposed within one or more of the WEAs, alternatives related to that facility would be developed and analyzed in a project-specific NEPA document, most likely in the form of an EIS.*

In this EA, Alternative A was analyzed as BOEM's Preferred Alternative because it allows for the greatest flexibility for the siting of meteorological towers and buoys while also protecting natural resources through the implementation of the SOCs, as described in Appendix B of this EA.

Alternative B was developed in response to comments on the NOI submitted by NOAA on January 17, 2013. Alternative B examined whether excluding the Wilmington West WEA from leasing and site assessment activities would reduce the likelihood of impacts on North Atlantic right whales. The reduction in the number of vessel trips under Alternative B would reduce the potential for ship strikes compared with Alternative A. However, with implementation of SOCs, the overall impacts on North Atlantic right whales would remain minor to moderate under Alternative B. Additionally, as discussed in Section 3, Wildlife*, because of the recent proposed extension of North Atlantic right whale critical habitat that overlaps with the Wilmington West WEA and a small portion of the Wilmington East WEA, additional analysis has been added in Section 4.4.2.5 of the EA that indicates that any effects on the proposed North Atlantic right whale critical habitat would be negligible to minor.*

Alternative C was developed in response to concerns about impacts on migrating North Atlantic right whales from noise generated by survey activities. This alternative includes seasonal restrictions on site characterization activities (surveys).

Several commenters requested that Alternative C or Alternative B, with seasonal restrictions on site assessment activities, be selected. These comments have been addressed in Section 3, Wildlife.

BOEM received several comments that expressed concern over the cable route from the wind turbine facility to the shore, in particular, effects related to planned terminal groin construction to address beach erosion on Bald Head Island's South Beach.

This EA uses direct lines between the middle of the potential lease areas and potential interconnection points onshore to approximate the reasonably foreseeable level of surveys that may be conducted to characterize undersea transmission cable routes (Figures 3-1 through 3-3 and Tables 3-1 and 3-2). Figures 3-1 through 3-3 show only the line used to approximate the level of surveys and in no way represent a proposed cable route. Section 3.2.1.1 of the EA was updated to address any confusion related to cable routes.

Effects from installation, construction, and operation of a cable route between an offshore wind energy facility and onshore connection to the grid are outside the scope of the analysis for the proposed action (see Section 1.4.2, Scope of Analysis*). Effects associated with site assessment and site characterization activities are the focus of this EA. However, in the event a proposal for development of an offshore wind energy facility in one or more of the WEAs (including the Wilmington West WEA) is submitted to BOEM, details regarding the cable route and potential effects will be included in that NEPA analysis.*

Section 6. NEPA Process

BOEM received comments that requested that an EIS be prepared for the proposed action to avoid a "piecemeal" analysis and commitment by BOEM to eventual construction of an offshore wind facility. Commenters also requested that an EIS be prepared for consideration of a COP for a commercial-scale wind energy facility and that a future EIS for approval of that facility allow for denial of the COP as well as incorporation of additional mitigation measures. Commenters also requested that cumulative effects include all federal actions in the vicinity of the proposed action and that preparation of a programmatic EIS be considered.

Currently there are no developers in a position to submit a COP for the WEAs offshore North Carolina (no leases have been awarded offshore North Carolina and therefore no one has acquired the necessary leasehold information to formulate such a plan). Because the specific information contained in a COP would be determinative of the reasonably foreseeable environmental consequences associated with the development of any lease, BOEM will not speculate in this EA as to what the consequences of the potential future development of a wind energy facility within the WEAs would be. Analyzing the specific environmental consequences of wind energy facility construction and operation would be impossibly speculative at this stage in the leasing process.

Section 1.1, Background*, of this EA describes the laws and regulations that allow and prescribe the process by which BOEM is to issue leases, easements, or rights-of-way on the OCS for the purpose of wind energy development. BOEM's renewable energy regulations (30 CFR 585) state that the issuance of leases and subsequent approval of wind energy development on* *the OCS is a staged decision-making process that occurs in four distinct phases. This EA covers the first two phases, Planning and Analysis and Lease Issuance, and a third phase, provided those activities proposed in a leaseholder's submitted SAP are consistent with the analysis and effects determinations contained in this EA.*

Selection of the three WEAs proposed in this EA included public outreach and coordination with interested stakeholders and the NC Task Force over a 4-year period (August 2010 to August 2014 [see Section 1.6.1.1, North Carolina Wind Energy Area Identification Planning*]). Phase 2, Lease Issuance, is the subject of the analysis contained in this EA, along with Phase 3 site assessment and site characterization activities. If a FONSI is issued for the proposed action or alternatives contained herein, BOEM will grant the right to use the leased area for development of plans. The lease does not grant the lessee the right to construct any facilities. The SAP would provide BOEM with the lessee's detailed proposal for the construction of a meteorological tower, installation and operation of meteorological buoys, or a combination of the two on the leasehold. BOEM may approve, approve with modification, or disapprove a lessee's SAP. As part of the SAP approval process, BOEM will determine whether this EA adequately considers the environmental consequences of the activities proposed in the lessee's SAP. If BOEM determines that it does not, another NEPA analysis will be conducted.*

In accordance with BOEM's renewable energy regulations, the fourth step is submission of a COP, which is a detailed plan for construction and operation of a wind energy facility on a lease. BOEM's approval of a COP allows the lessee to construct and operate wind turbine generators and associated facilities for a specified term. If a COP is submitted, BOEM will prepare a project-specific NEPA analysis. This would most likely take the form of an EIS and would provide additional opportunities for public involvement, pursuant to NEPA. As with a SAP, BOEM may approve, approve with modification, or disapprove a lessee's COP. In addition, BOEM would initiate consultations, which would include Section 7 consultations under the ESA and Section 106 consultations under the NHPA, among other consultations.

Cumulative effects are the result of all impact-causing activities that affect a resource while the impacts of a proposed action are occurring or while they remain in effect. The effects of a project, when combined with those of other activities, cause synergistic effects, which are different from those of individual projects and could be significant. Additive and synergistic effects are identified by a cumulative analysis. Because the proposed action's construction and decommissioning activities would be short term, lasting 8 to 10 weeks, and would occur well offshore where no other "development" or projects would be occurring or reasonably foreseeable to occur, additive or synergistic effects related to such activities would be temporary and limited to the local area. The proposed action would increase the number of vessel trips during construction as well as site assessment and site characterization activities, which would have an additive effect. Therefore, the additive effect is the focus of the cumulative analysis in this EA.

BOEM received comments that indicated that an insufficient amount of time was provided for public review of the draft EA.

The EA was available for public comment for 30 days. In addition, BOEM held public meetings to provide information on the EA and solicit public comments during the 30-day *comment period. These meetings were held in Kitty Hawk, Wilmington, and Carolina Shores, NC. In response to the EA, BOEM received 199 comments. There will be additional opportunities for the public to comment on the issuance of wind energy leases for offshore North Carolina during the 60-day comment period for the Proposed Sale Notice.*

BOEM received a comment that suggested that site assessment activities would result in significant effects on visual and recreational resources; therefore, an EIS is required.

Site assessment and site characterization activities are the focus of this EA. The effects on visual resources were determined to be negligible (Section 4.4.4.6, Visual Resources*). Effects on recreation from site assessment and site characterization activities were determined to be negligible to minor (Section 4.4.4.4,* Recreation and Tourism*, and Section 4.4.4.5, Commercial* and Recreational Fisheries*). BOEM's NEPA procedures and NEPA regulations allow for preparation of an EA when no significant impacts (see 40 CFR 1508.27 [criteria for defining "significantly"]) result from a proposed action. If the analysis in the EA concludes that a proposed action will not result in significant effects, an EIS is not required. In that case, a FONSI will be prepared (40 CFR 1508.13).*

Section 7. Navigation

BOEM received comments related to navigational safety and increased risk of vessel collision due to the placement of wind turbines in the Wilmington West WEA. Commenters requested that BOEM consider expanding the Kitty Hawk WEA to the west 15 to 24 nm offshore and moving the navigation channel.

BOEM worked closely with USCG and maritime stakeholders to avoid impacts on navigational safety. The Kitty Hawk WEA allows for all vessel types to navigate safely and avoids the mixing of different vessel types (i.e., slower tug and barge vessels with larger, faster cargo vessels) for site assessment and site characterization activities. Effects from installation, construction, and operation of a full-scale offshore wind energy facility are outside the scope of the analysis for the proposed action (see Section 1.4.2, Scope of Analysis*).*

BOEM received a comment that requested that an analysis of potential effects on navigation be conducted if wider, deeper channels are considered, as proposed in the *25-Year Vision for North Carolina* publication. The commenter also suggested that risk related to vessel allisions with wind turbines was too high in the Kitty Hawk area.

The 25-Year Vision for North Carolina: Mapping our Future *(Vision plan) (North Carolina Department of Transportation, n.d.) publication does not provide any specifics related to where channel deepening may occur. The Vision plan states that the intent is to "develop and implement a proactive, long-range plan for stabilizing our shallow draft inlets and shipping channels, providing important opportunities for industry and improved reliability for our vital ferry routes." Although specific locations for channel deepening under the Vision plan are unknown, it is unlikely that a single meteorological tower and two buoys located in each of the WEAs and far offshore would affect plans to deepen channels or shallow draft inlets near North Carolina ports. BOEM is funding a study, "*Wind Energy Development on the Atlantic OCS: The Identification of Port Modifications and their Environmental and Socioeconomic

Consequences.*" A report objective is to understand how planned port infrastructure modifications, such as channel deepening to accommodate larger post-panamax ships, may co-benefit offshore wind energy development and if there are any perceived conflicts.*

In preparation for potential development off the coast of North Carolina, BOEM continues its work with USCG. As a cooperating agency in BOEM's environmental review process, USCG has defined its responsibilities related to offshore renewable energy installations via its Navigational and Vessel Inspection Circular No. 02-07. *This document identifies the information offshore wind energy developers need to provide to support a thorough risk hazard assessment review. Additionally, USACE is required to issue a permit that assesses whether offshore structures pose a navigational hazard.*

Section 8. Military

BOEM received several comments that expressed concern over the Sunny Point military installation and the risk of collisions with military vessels that carry munitions.

BOEM worked with DOD early in the planning process to identify potential conflicts with military activities and eliminate those areas from further leasing consideration. Through this collaboration, BOEM removed multiple areas from leasing consideration, including the explosives offloading area for the Sunny Point military installation. In addition, ships would not intersect the WEAs while transiting to and from Sunny Point.

Section 9. Tourism and Recreation

BOEM received comments that expressed concern regarding effects on tourism, recreation, and fishing (commercial and recreational) as a result of wind turbines within the WEAs.

An analysis of effects on tourism as well as recreational and commercial fishing as a result of the proposed action and alternatives is included in this EA (Sections 4.4.4.4 and 4.4.4.5, respectively). The analysis determined that effects on tourism and fishing (commercial and recreational) from site assessment and site characterization activities would be negligible to minor. Effects associated with construction and operation of a commercial-scale wind energy facility are outside the scope of this analysis (Section 1.4.2, Scope of Analysis*). In the event that a commercial-scale wind energy facility is proposed within one or more of the WEAs, effects related to that facility would be analyzed in a project-specific NEPA document, most likely in the form of an EIS.*

Section 10. Other

BOEM received comments that requested that effects on the Jay Bird and Frying Pan shoal/borrow areas be analyzed.

All sand borrow areas of offshore Wilmington are located within state waters (i.e., 1 to 3 nm offshore) and well outside of the North Carolina WEAs. All future planning and siting (including that related to transmission lines) will take sand borrow areas into consideration.

BOEM received a comment that requested that the timeframe for decommissioning of the meteorological towers and buoys be clarified. Specifically, the commenter inquired whether meteorological tower decommissioning activities would be permitted outside of the April to August timeframe.

The expected months when decommissioning would occur would be April to August; however, decommissioning would not be prohibited outside these months. More information on meteorological tower decommissioning can be found in Section 3.2.2.5 of this EA.

BOEM received comments regarding impacts on high frequency (HF) radar from wind turbines offshore North Carolina.

HF radar sensors must look through any obstructions between the coastline and the ocean by propagating a vertically polarized electromagnetic wave along the ocean surface, and the potential exists for interference to HF radar operations from offshore wind turbines. NOAA's Integrated Ocean Observing System has indicated that there is a potential negative impact on existing HF radar systems; the extent of the impact is unknown, however, until real-world measurements can be taken. At present, only modeling studies indicate the potential for negative impacts on HF radar systems.

Effects from the installation, construction, and operation of a full-scale wind energy facility are outside the scope of the analysis for the proposed action (see Section 1.4.2, Scope of Analysis*). In the event that a lessee submits a COP for a full-scale wind energy facility, BOEM would conduct a site-specific environmental analysis that would most likely take the form of an EIS. The effects of an offshore wind facility on HF radar would be analyzed at that time.*

BOEM received a comment requesting that the EA include data validating that wind turbines would be effective offshore in NC be included in the EA.

The purpose of the proposed action is to conduct site assessment and site characterization activities to gather data and determine the viability and suitability of wind energy facilities within the WEAs. In the event a proposal for a full-scale wind energy facility is received by BOEM, much of the data would be used in planning and design as well as analysis of potential effects on various resources within and around the WEAs from such a facility.

BOEM received comments that requested that an analysis of risk to wind turbines from hurricanes and storms be included in the EA.

Analysis of a wind energy facility is outside the scope of the EA (Section 1.4.2, Scope of Analysis*), but the potential for hurricanes and storms in the WEAs is discussed in Section 3.3.1. In the event a proposal for a wind energy facility is submitted to BOEM, effects on wind turbines as a result of hurricanes and other large storms would be included in that NEPA analysis.*

BOEM received a comment that indicated that the analysis of the affected area for the Wilmington West WEA was inadequate because it only covered areas north of Cape Fear, and most South Brunswick Islands face south. In addition, it did not cover Sunset Beach, Bird Island, or areas in South Carolina.

The visual analysis in Appendix F includes both Bald Head Island (with a view that is oriented southward) and Sunset Beach (with a view that is oriented southeasterly). No onshore activities would occur within the South Brunswick Islands area because no land-based deployment or other activities are anticipated to occur in that area. The South Brunswick Islands environs were included in the analysis of offshore activities of the proposed action, which would include vessel traffic and construction and operation of the meteorological tower and buoys (i.e., site assessment and site characterization activities). Therefore, no changes were made to the EA.

BOEM received comments that indicated that the analysis failed to address effects on multiple resources from installation and operation of a full-scale wind facility (including wind turbines and other associated facilities).

Effects from installation, construction, and operation of a full-scale wind energy facility are outside the scope of the analysis for the proposed action. Effects associated with site assessment and site characterization activities are the focus of the EA (see Section 1.4.2, Scope of Analysis*). The proposed action and alternatives include assessments and surveys for certain resources (e.g., marine, avian, and other species). These assessments and surveys could be used in a future NEPA analysis should a potential wind developer propose a commercial-scale wind farm within an approved WEA. Site assessment and site characterization activities are intended to determine whether conditions are suitable for a wind energy facility. The results may indicate that conditions are not suitable. In the event that a wind developer determines that a leased WEA is viable for development of a commercial-scale wind farm, it is anticipated that an EIS would be prepared for that proposed action. That proposal is anticipated to include the details necessary to analyze effects from construction and operation of wind turbines because it would include details regarding the type, number, spacing, cable connection route, construction and operational requirements, and other factors.*

BOEM received a comment that requested an analysis of GHG effects for wind turbines, including the entire life cycle of the turbine (i.e., energy use and GHG emissions associated with construction of the individual turbines and their components as well as transport of the turbines to their ultimate operation location).

Appendix D of the EA included anticipated metric tons of GHG emissions associated with the proposed action. Table 4-1 in Section 4.4.1.1 has been updated to include GHG emissions calculations. The proposed action does not include procurement, installation, or operation of wind turbines. The analysis requested in this comment is outside the scope of this EA (Section 1.4.2, Scope of Analysis*). In the event that a lessee submits a COP for a full-scale wind energy facility, BOEM would conduct a site-specific environmental analysis, which would most likely take the form of an EIS. That environmental document would include an analysis of GHG emissions that would result from the construction, operation, and decommissioning of an offshore wind energy facility.*

BOEM received comments that requested that an analysis of catastrophic failure of the wind turbine facility be prepared.

Analysis of a wind energy facility is outside the scope of the EA (Section 1.4.2, Scope of Analysis*). In the event that a COP for a wind energy facility is submitted to BOEM, the potential* *for failure or breakdown of wind turbines would be included in a project-specific NEPA analysis that would likely take the form of an EIS.*

BOEM was asked to include an analysis of trash and debris effects on shore areas from vessels associated with site assessment and site characterization activities.

Section 4.4.4.4, Recreation*, includes an analysis of potential effects related to trash and debris. The EA determined that compliance with federal regulations would reduce risks associated with the generation of trash. Furthermore, the added vessel traffic, compared with existing vessel traffic, would generate a minimal amount of trash and debris. Site assessment and site characterization activities would require 87 round trips, on average, per port per year. The effects were determined to be negligible and, therefore, no additional information has been added to the EA.*

BOEM received a comment that requested that information regarding the extent and nature of construction for both onshore and offshore facilities be provided.

The EA details all construction activities associated with the proposed action in Chapters 2 and 3. As discussed therein, all onshore activities will take place at existing facilities. Onshore activities would be limited to the fabrication and staging of meteorological towers and/or buoys, which would take place at existing fabrication yards and ports, and vessel use of existing ports and marinas along the coastline. None of these activities would result in the expansion of fabrication yards, ports, or marinas.

5.2 Cooperating Agencies

Section 1500.5(b) of the CEQ implementing regulations (40 CFR 1500.5(b), November 29, 1978) encourages agency cooperation early in the NEPA process. A federal agency can be a lead, joint lead, or cooperating agency. A lead agency manages the NEPA process and is responsible for the preparation of an EA or EIS; a joint lead agency shares these responsibilities; and a cooperating agency that has jurisdiction by law or special expertise with respect to any environmental issue participates in the NEPA process upon the request of the lead agency. The NOI included an invitation to other federal agencies and state, tribal, and local governments to consider becoming cooperating agencies in the preparation of this EA. Currently, USACE, USCG, NPS, and the Bureau of Safety and Environmental Enforcement participated in the development and review of this EA.

5.3 Consultations

5.3.1 Endangered Species Act

Concurrent with the NEPA process, BOEM has consulted with both USFWS and NMFS for activities considered in this EA and species under their respective jurisdictions. BOEM prepared a BA (BOEM, 2012c) that analyzed proposed activities associated with the WEAs and federally listed species that have potential to be present in the project area or vicinity. Site characterization activities (e.g., HRG surveys, geotechnical/sub-bottom sampling, and biological resource surveys) and the installation of meteorological buoys were covered by the earlier BA prepared for the G&G Final PEIS (BOEM, 2014a) and the subsequent BO issued by NMFS (NMFS, 2013a). USFWS issued concurrence that OCS G&G activities would have no effect or would not be likely to adversely affect any listed species or critical habitat (Appendix E). The following is a summary of the consultations for site assessment activities (meteorological tower installation) that were not covered under the NMFS G&G BO (NMFS, 2013a) or the letter of concurrence issued by USFWS for G&G activities.

5.3.1.1 U.S. Fish and Wildlife Service

In June 2013, BOEM submitted a species list to USFWS and NMFS in anticipation of preparation of a BA and Section 7 consultation for proposed activities not covered in the NMFS G&G BO in areas on the Atlantic OCS offshore North Carolina, South Carolina, and Georgia. In February 2014, BOEM submitted the BA to USFWS and initiated consultation for the following activities:

1. issuing renewable energy leases;
2. associated site characterization activities that lessees may undertake on those leases (e.g., geophysical, geotechnical, archaeological, and biological surveys); and
3. the subsequent approval of site assessment activities on the leaseholds (e.g., installation, operation, and decommissioning of meteorological towers and buoys).

On March 17, 2014, USFWS concurred with BOEM's findings in the BA that commercial wind lease issuance and site assessment activities on the Atlantic OCS offshore North Carolina, South Carolina, and Georgia may affect, but will not likely adversely affect, the Bermuda petrel, black-capped petrel, Kirtland's warbler, roseate tem, piping plover, and red knot (which has since been listed as threatened by USFWS [FR 73706-73748, December 11, 2014]). For the West Indian manatee and piping plover critical habitat, USFWS concurs with BOEM's determination of *no effect*. The USFWS determination covered a total of 352 whole and 156 partial OCS lease blocks (totaling 960,288 hectares). The area covered in this EA is significantly smaller (~55.5 OCS lease blocks) than the area covered in the BA, which covered more than 289 OCS lease blocks. Therefore, the level of effects caused by the activities described in this EA would be much lower than the level of effects covered in the consultation.

5.3.1.2 National Marine Fisheries Service

In February 2014, BOEM requested consultation with NMFS in the form of a programmatic BA, which covered lease issuance, site characterization, and site assessment activities offshore North Carolina, South Carolina, and Georgia (BOEM, 2014b). On August 1, 2014, NMFS declined BOEM's programmatic ESA consultation request and indicated that, because site characterization surveys and buoy installation are covered under the NMFS G&G BO, it would consult on individual site assessment plans for installation, operation, and decommissioning of meteorological towers. On October, 14, 2014, BOEM sent NMFS a letter determining that because previous consultations cover the reasonably foreseeable activities proposed offshore North Carolina (lease issuance, site characterization surveys, and meteorological buoy installation), no further consultation is required (see letter from BOEM to NMFS in Appendix E). BOEM indicated that all site characterization and assessment activities described in this EA, with the exception of meteorological tower installation activities, are covered by the

NMFS G&G BO (NMFS, 2013a). BOEM informed NMFS that if survey plans from lessees for WEAs in North Carolina were received by BOEM, BOEM would review them to ensure that they are wholly consistent with the NMFS G&G BO, and for activities not covered by the NMFS G&G BO (e.g., meteorological tower construction), consultation with NMFS would be initiated. On June 16, 2014, NMFS issued its letter of concurrence (see Appendix E) that site characterization and assessment activities for buoy installation were covered under the programmatic BO issued for the G&G Final PEIS (BOEM, 2014a).

5.3.2 Magnuson-Stevens Fishery Conservation and Management Act

Pursuant to Section 305(b) of the MSFCMA, federal agencies are required to consult with NMFS on any action that may result in adverse effects on EFH. NMFS regulations implementing the EFH provisions of the MSFCMA can be found at 50 CFR 600. Certain OCS activities authorized by BOEM may result in adverse effects on EFH and, therefore, require consultation with NMFS. BOEM submitted the EFH assessment included in this EA to NMFS on February 5, 2015. In this assessment BOEM determined that the proposed action would not significantly affect the quality and quantity of EFH in the action area. On February 23, 2015, NMFS responded that it had no additional comments in regard to BOEM's EFH assessment. When or if a SAP is submitted to BOEM for the areas considered in this EA, BOEM will review the action in coordination with NMFS to ensure it is within the scope of the assessed impacts.

5.3.3 Coastal Zone Management Act

The Coastal Zone Management Act requires that federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be "consistent to the maximum extent practicable" with relevant enforceable policies of a state's federally approved coastal management program (15 CFR 930, Subpart C). If an activity will have direct, indirect, or cumulative effects, the activity is subject to a federal consistency determination. BOEM will perform a consistency review and prepare a Consistency Determination (CD) for the states of Virginia, North Carolina, and South Carolina.

BOEM has determined that Virginia, North Carolina, and South Carolina share common coastal management issues and have similar enforceable policies as identified by their respective coastal zone management plans. Given the proximity of the WEAs to each state, the similarity of the reasonably foreseeable activities for the WEAs, and the similarity of impacts on environmental and socioeconomic resources and uses within each state, BOEM will prepare a single CD under 15 CFR 930.36(a) to determine whether issuing leases and approving site assessment activities (including the installation, operation, and decommissioning of meteorological towers and buoys) in the WEAs offshore North Carolina is consistent to the maximum extent practicable with the provisions identified as enforceable by the coastal zone management plans of Virginia, North Carolina, and South Carolina.

The EA provides the comprehensive data and information required under 30 CFR 939.39 to support BOEM's CD. When the states receive the CD, they will have 60 days to review it. Additionally, the states have 14 days after receiving the CD to identify any missing information required by 30 CFR 930.39(a) and notify BOEM.

5.3.4 National Historic Preservation Act

Section 106 of the NHPA (54 U.S.C. § 306108) and its implementing regulations (36 CFR 800) require federal agencies to consider the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. BOEM has determined that its issuance of commercial leases and approval of SAPs constitute undertakings subject to Section 106 review. These undertakings have the potential to cause effects on historic properties insofar as these actions may lead to lessees conducting geotechnical testing and installing and operating site assessment facilities (e.g., meteorological towers or buoys).

BOEM executed a Programmatic Agreement pursuant to 36 CFR 800.14(b) to fulfill its obligations under Section 106 of the NHPA for renewable energy activities on the OCS offshore North Carolina. BOEM developed this agreement for two primary reasons: first, BOEM's decisions to issue leases and approve SAPs, COPs, or other plans are complex and multiple; and second, BOEM would not have the results of archaeological surveys prior to the issuance of leases and, as such, would be conducting historic property identification and evaluation efforts in phases (36 CFR 800.4(b)(2)). The Programmatic Agreement establishes the process to determine and document the area of potential effects for each undertaking; to identify historic properties within the area of potential effects; to assess potential adverse effects; and to avoid, reduce, or resolve any such effects through the process set forth in the Programmatic Agreement. The North Carolina Programmatic Agreement was executed on June 6, 2014, among BOEM, the North Carolina SHPO, and ACHP.

In September 2014, BOEM initiated Section 106 consultation for the undertaking of issuing commercial leases within the North Carolina WEAs through letters of invitation to the North Carolina SHPO and ACHP as signatories to the agreement, as well as to the South Carolina SHPO and Catawba Indian Nation. BOEM additionally contacted representatives of local governments, historic preservation groups, state-recognized tribes, and other federal agencies to solicit information on historic properties and to determine their interest in participating as a consulting party (Table 5-1).

In May 2015, BOEM made a Finding of No Historic Properties Affected for the undertaking of issuing commercial leases within the North Carolina WEAs (Finding). The Finding is based on the review conducted by BOEM of existing and available information, consultation with interested and affected parties, and the conclusions drawn from this information. The required identification and avoidance measures that will be included in commercial leases issued within the North Carolina WEAs will ensure that the proposed undertaking will not affect historic properties (See Section 4.4.4.1). BOEM shared the Finding and supporting documentation with the consulting parties; the Finding is available on BOEM's website at: http://www.boem.gov/NC-WEAs-Lease-Issuance.

Table 5-2
Entities Solicited for Information and Concerns Regarding Historic Properties

Other Federal Agencies			
National Oceanic and Atmospheric Administration, Monitor National Marine Sanctuary	National Park Service, Southeast Regional Office	National Park Service, Cape Hatteras National Seashore	National Park Service, Cape Lookout National Seashore
State-Recognized Tribes			
Coharie Tribe	Haliwa-Saponi Tribe	Lumbee Tribe of North Carolina	Meherrin Indian Tribe
Occaneechi Band of the Saponi Nation	Sappony	Waccamaw Siouan Tribe	
Local Governments			
Brunswick County	Carteret County	City of Southport	City of Wilmington
City of Wilmington Environmental Affairs	Currituck County Board of Commissioners	Dare County	Hyde County Board of Commissioners
Kill Devil Hills	New Hanover County Board of Commissioners	Onslow County Board of Commissioners	Pender County Board of Commissioners
Town of Atlantic Beach	Town of Caswell Beach	Town of Holden Beach	Town of Kitty Hawk
Town of Kure Beach	Town of Manteo	Town of Morehead City	Town of Nags Head
Town of North Topsail Beach	Town of Oak Island	Town of Ocean Isle Beach	Town of Southern Shores
Town of Sunset Beach	Town of Surf City	Village of Bald Head Island	
Other Organizations			
Atlantic Beach Historical Society	Historic Wilmington Foundation	Horry County Historical Society	Horry County Museum
North Myrtle Beach Area Historical Museum	Outer Banks Conservationists, Inc.		

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The Department of the Interior Mission

As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the sound use of our land and water resources, protecting our fish, wildlife and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island communities.

The Bureau of Ocean Energy Management

The Bureau of Ocean Energy Management (BOEM) works to manage the exploration and development of the nation's offshore resources in a way that appropriately balances economic development, energy independence, and environmental protection through oil and gas leases, renewable energy development and environmental reviews and studies.

APPENDICES

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APPENDIX A
ANNOUNCEMENT OF AREA IDENTIFICATION FOR COMMERCIAL WIND ENERGY LEASING ON THE OUTER CONTINENTAL SHELF OFFSHORE NORTH CAROLINA

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ANNOUNCEMENT OF AREA IDENTIFICATION

Commercial Wind Energy Leasing on the Outer Continental Shelf Offshore North Carolina

August 7, 2014

The Bureau of Ocean Energy Management (BOEM) is proceeding with competitive commercial wind energy leasing on the Outer Continental Shelf (OCS) offshore North Carolina, as set forth by 30 CFR 585.211 through 585.225. The next step in the competitive leasing process, and the purpose of this announcement, is Area Identification. BOEM has defined three Wind Energy Areas (WEAs) offshore North Carolina (Figure 1). The Kitty Hawk WEA begins about 24 nautical miles (nm) from shore and extends approximately 25.7 nm in a general southeast direction at its widest point. Its seaward extent ranges from 13.5 nm in the north to .6 nm in the south. It contains approximately 21.5 OCS blocks (122,405 acres). The Wilmington West WEA begins about 10 nm from shore and extends approximately 12.3 nm in an east-west direction at its widest point. It contains just over 9 OCS blocks (approximately 51,595 acres). The Wilmington East WEA begins about 15 nm from Bald Head Island at its closest point and extends approximately 18 nm in the southeast direction at its widest point. It contains approximately 25 OCS blocks (133,590 acres).

All three WEAs will be considered for leasing and approval of site assessment plans as the proposed action under the National Environmental Policy Act (NEPA) (42 U.S.C. §§ 4321-4370f). BOEM also has identified an alternative to the proposed action that would exclude one of the WEAs from consideration for lease issuance and approval of site assessment activities, and another alternative that would establish seasonal restrictions on certain site characterization activities. This announcement also identifies mitigation measures to be considered further in the NEPA document.

On December 13, 2012, BOEM published in the *Federal Register* the *Commercial Leasing for Wind Power on the Outer Continental Shelf Offshore North Carolina—Call for Information and Nominations* (Call) (77 FR 74204-74213) and *Notice of Intent to Prepare an Environmental Assessment* (NOI) (77 FR 74218-74220).

Comments on the Call and NOI and BOEM studies identified multiple space use conflicts within the Call areas. BOEM worked closely with Federal, state, local and industry stakeholders to avoid existing high use and sensitive resource areas while maximizing areas for offshore wind development. BOEM made the following exclusions from the Call areas prior to defining the three WEAs.

- **Kitty Hawk WEA.** Call Area Kitty Hawk included certain areas that overlapped with traditional shipping routes used by both tug and barge and deep draft (primarily container ships) vessels. BOEM worked closely with the United States Coast Guard (USCG) and the maritime community to modify Call Areas Kitty Hawk and Wilmington East in an effort to reduce potential conflicts with vessel navigation and safety. In addition, the National Park Service requested that areas within 33.7 nm of Bodie Island Lighthouse be excluded from development, and the Town of Kitty Hawk passed a resolution requesting that BOEM exclude areas within 20 nm of the coast from development. In response to these concerns, areas within 33.7 nm of Bodie Island Lighthouse and 24 nm from the coastline have been excluded from inclusion in the Kitty Hawk WEA (Figure 2).

- **Wilmington West WEA.** During public open houses held in 2013, BOEM presented the results of our North Carolina Visual Simulation Study. In response, stakeholders expressed concern about the visual impacts of future wind energy development in Call Area Wilmington West during both the day and night time. In response to these concerns, areas within 10 nm of the coastline have not been included as part of the Wilmington West WEA (Figure 3). Although portions of lease blocks included in the WEA are within 10 nm of shore, BOEM will not allow the installation of turbines within those areas.
- **Wilmington East WEA.** Call Area Wilmington East included certain areas that overlapped with traditional shipping routes used by both tug and barge and deep draft (primarily container ships) vessels, many of which utilize the Port of Wilmington. BOEM has worked closely with the USCG and the maritime community to modify the Call Area in an effort to minimize impacts to vessels utilizing the Port of Wilmington while still allowing for offshore wind development. In addition, through an ongoing cooperative agreement with UNC Chapel Hill and an interagency agreement with the National Oceanic and Atmospheric Administration (NOAA), areas of high topographic relief and patches of consolidated hard bottom, both of which were found to be correlated with high fish densities, were identified in the Call Area. In response to these navigational safety concerns and the presence of sensitive habitat, BOEM excluded these areas from inclusion in the Wilmington East WEA (Figure 4).

Alternatives to the proposed action (Alternative A) include:

- Elimination of Wilmington West area due to potential impacts to migrating North Atlantic right whales (Alternative B).
- Establishment of seasonal restrictions on site characterization activities, specifically geological and geotechnical surveys, during peak migration of North Atlantic right whales (November 1 – April 30) (Alternative C).

The agency is currently only considering the issuance of leases and approval of site assessment plans in these WEAs. BOEM is not considering, and the EA will not support, any decision(s) regarding the construction and operation of wind energy facilities on leases which will potentially be issued in these WEAs. If, after leases are issued, a lessee proposes to construct a commercial wind energy facility, it would submit a construction and operations plan. If and when BOEM receives such a plan, it would prepare a site-specific NEPA document for the project proposed, which would include the lessee's proposed transmission line(s) to shore. These cable routes would underlie areas outside of the WEAs, and may include areas beneath the areas with conflicts from vessel traffic, visual impacts, hard bottom, and fishing.

BOEM has also identified mitigation measures that may reduce the potential for adverse impacts to North Atlantic right whales, other marine mammals, and sea turtles. Such measures include vessel speed restrictions and enhanced monitoring. These measures, and possibly others, will be analyzed in the EA, and if adopted, could be imposed as binding requirements in the form of stipulations in the lease instrument and/or conditions of approval of a site assessment plan.

Based upon consultations with Federal agencies, states, local governments, and affected Indian tribes and public comments received, BOEM will continue to consider additional measures that may reduce the potential for adverse environmental consequences, and may identify other issues to be considered in the EA.

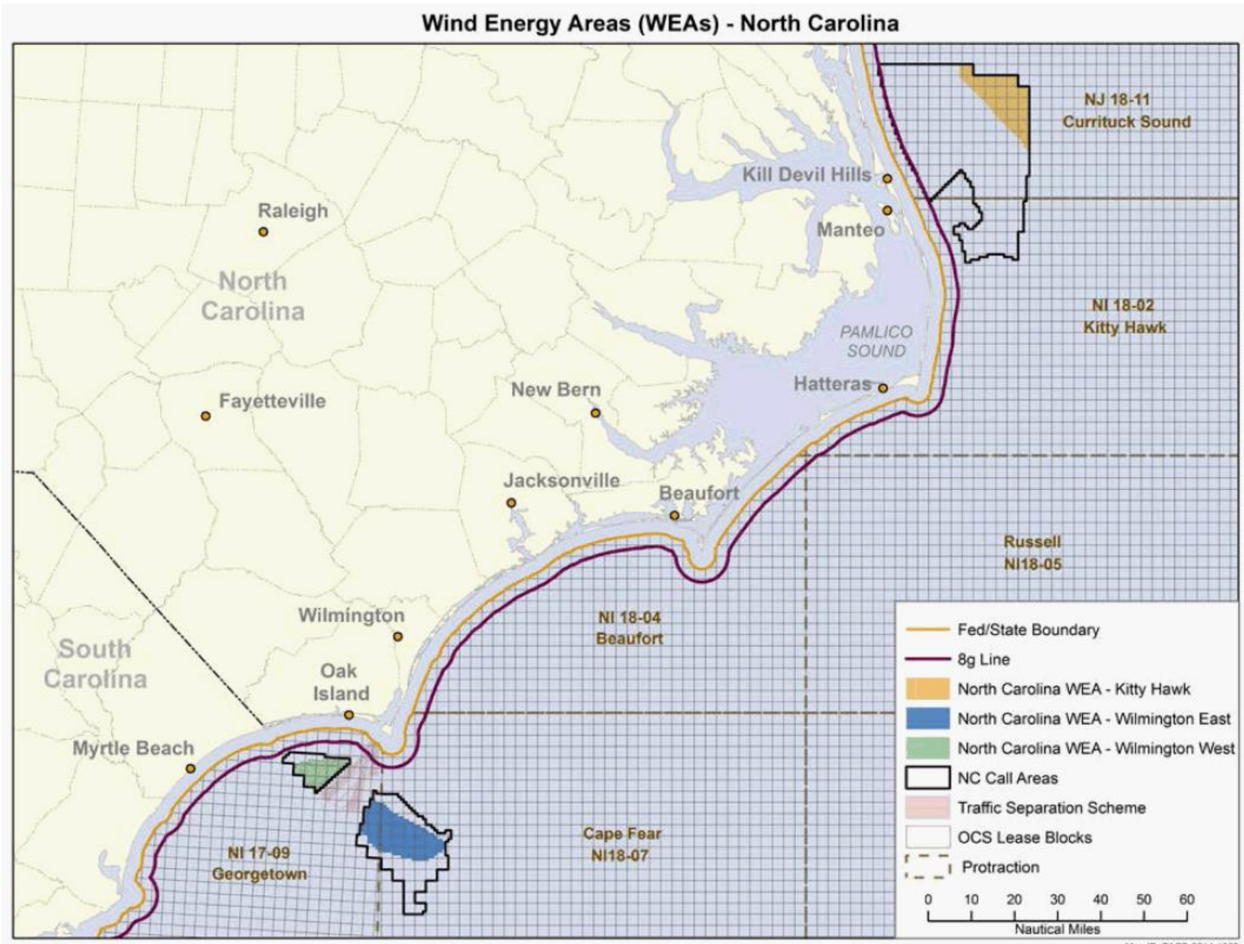

Figure 1. Wind Energy Areas identified offshore North Carolina for analysis as the Proposed Action (Alternative A) in the EA.

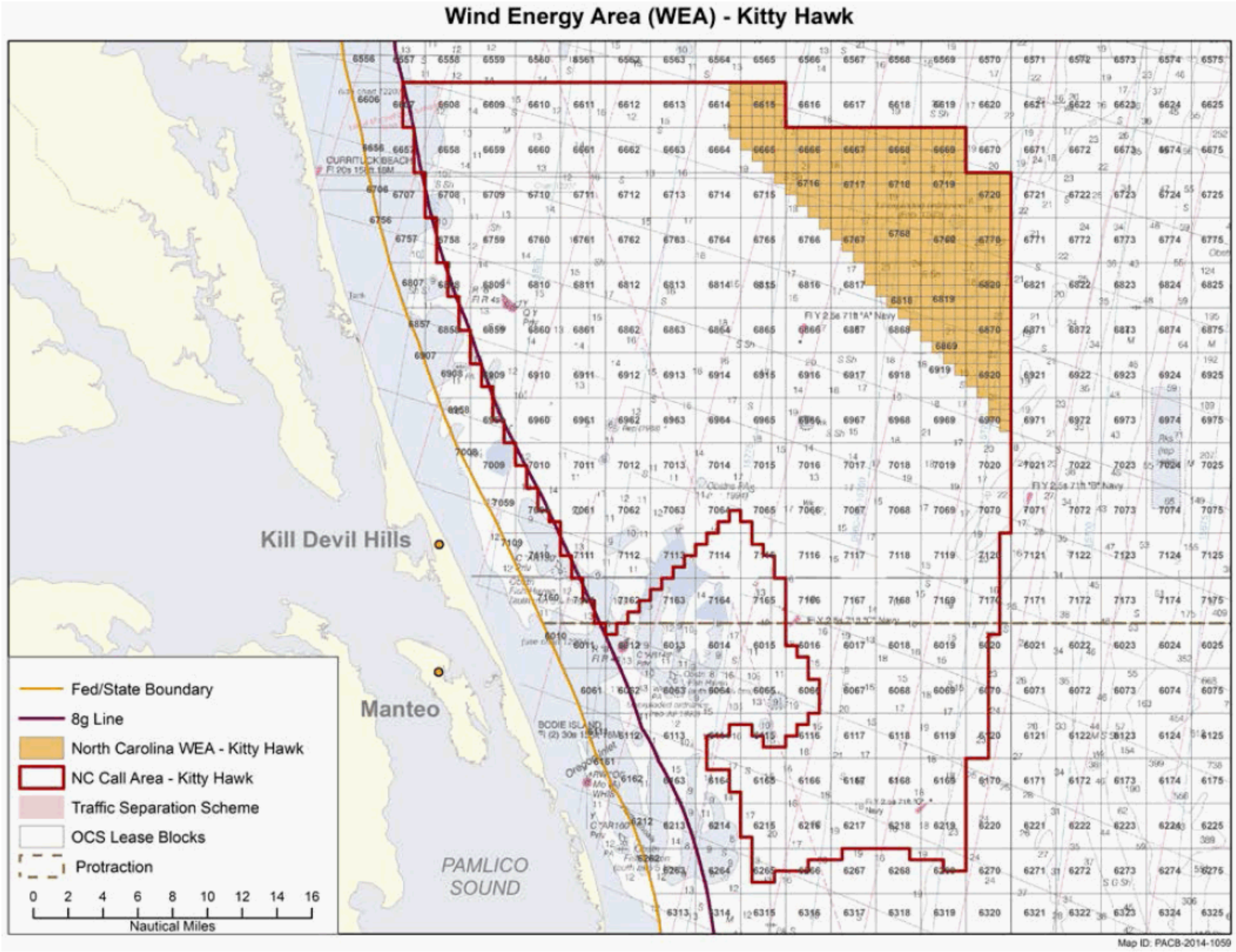

Figure 2. North Carolina Wind Energy Area Kitty Hawk

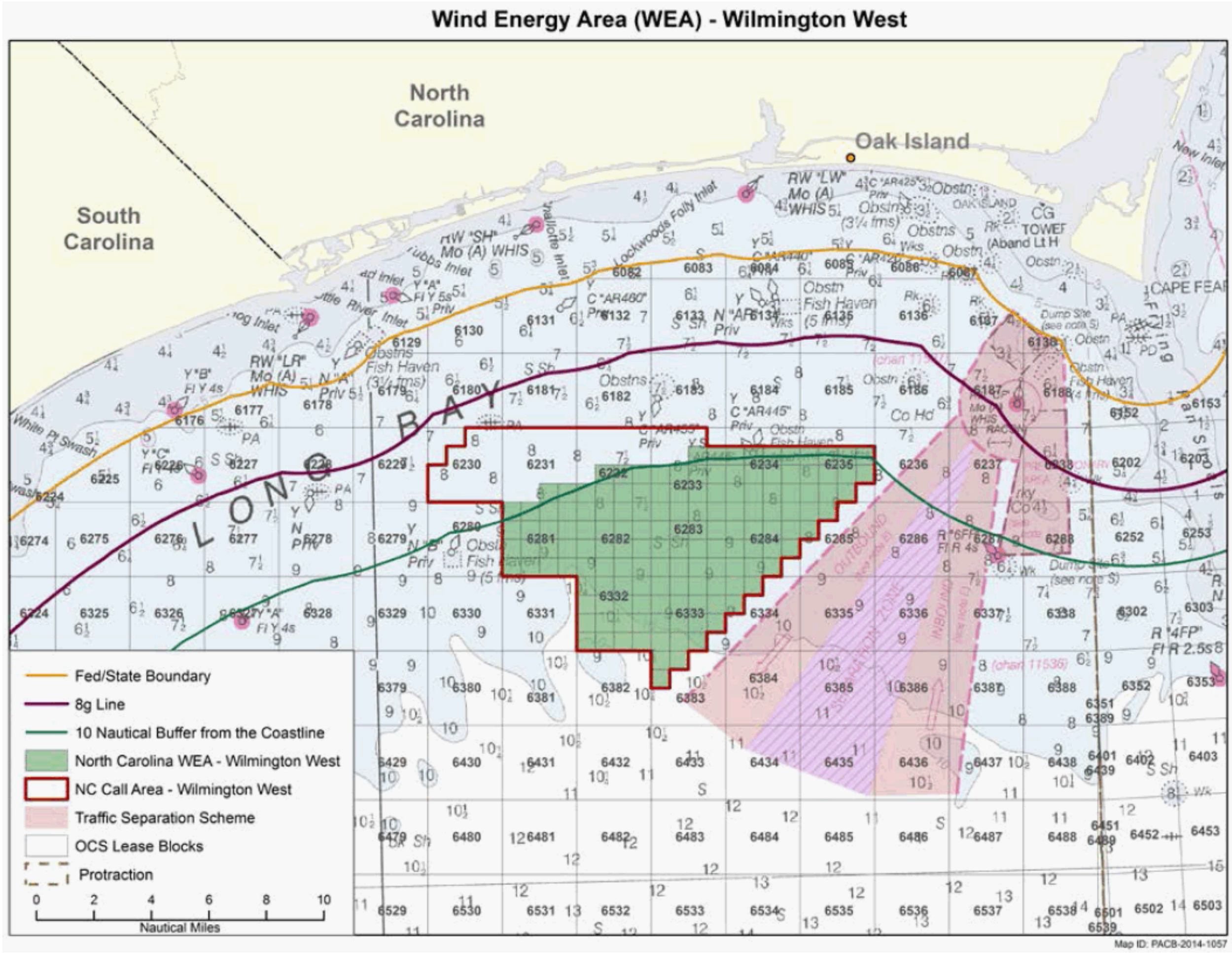

Figure 3. North Carolina Wind Energy Area Wilmington West

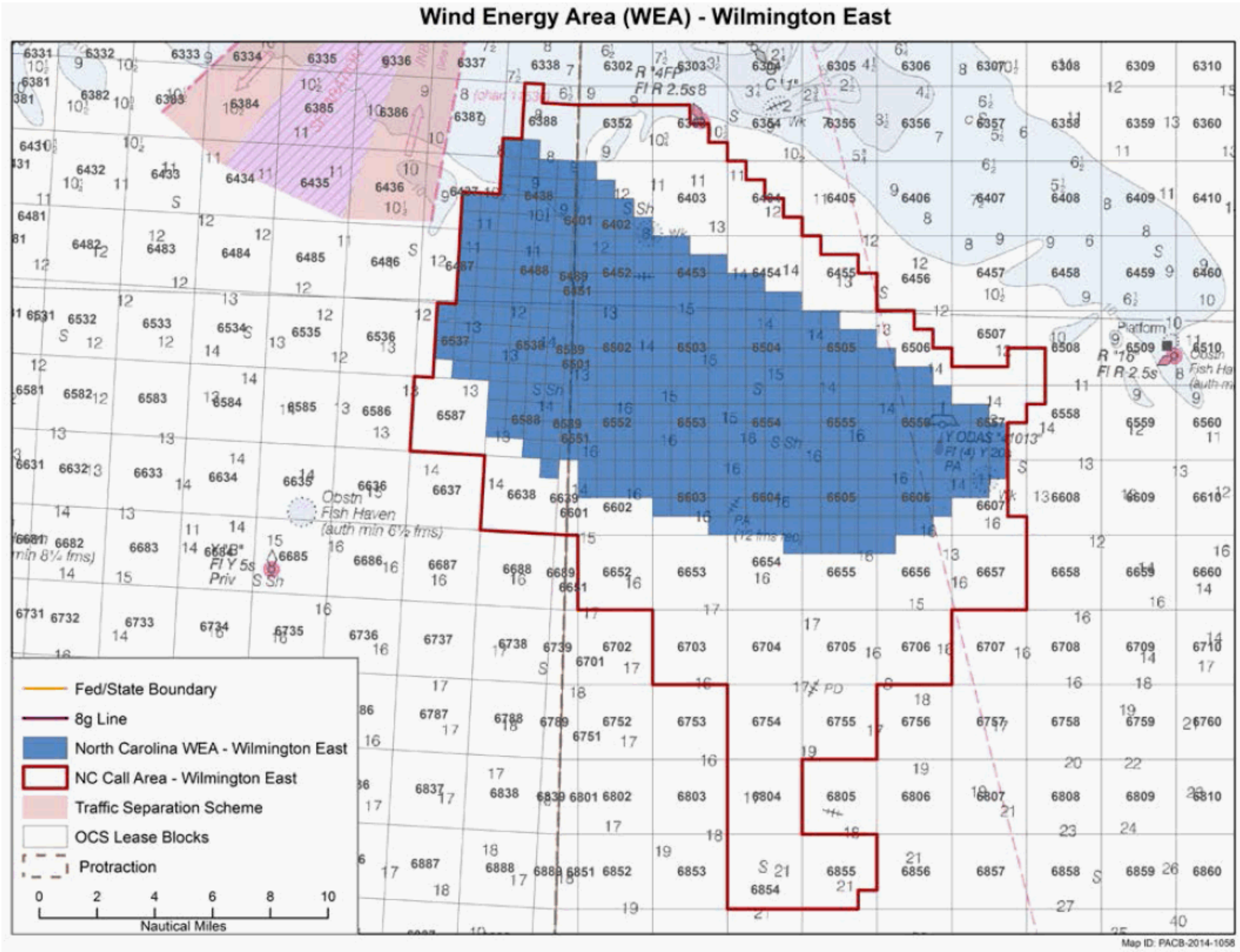

Figure 4. North Carolina Wind Energy Area Wilmington East

APPENDIX B
STANDARD OPERATING CONDITIONS

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B. STANDARD OPERATING CONDITIONS FOR PROTECTED SPECIES

This section outlines and provides the substance of the standard operating conditions (SOCs) that are part of the proposed action (for pile driving SOCs refer to section 4.4.2.5 of the EA) and which minimize or eliminate potential impacts to protected species including Endangered Species Act (ESA)-listed species of marine mammals and sea turtles.

These SOCs were developed by the Bureau of Ocean Energy Management (BOEM) and refined during previous consultations with the National Marine Fisheries Service (NMFS) under Section 7 of the ESA. Additional conditions and/or revisions to the conditions below may be developed during future consultation with NMFS.

B.1. GENERAL REQUIREMENTS

1. Prior to the start of operations, the Lessee must hold a briefing to establish responsibilities of each involved party, define the chains of command, discuss communication procedures, provide an overview of monitoring procedures, and review operational procedures. This briefing must include all relevant personnel, crew members, and Protected-Species Observers (PSOs). New personnel must be briefed as they join the work in progress.
2. The Lessee must ensure that all vessel operators and crew members, including PSOs, are familiar with, and understand, the requirements specified in Appendix B.
3. The Lessee must ensure that a copy of the Standard Operating Conditions (Appendix B) is made available on every project-related vessel.

B.1.1. Vessel Strike Avoidance Measures

The Lessee must ensure that all vessels conducting activity in support of a plan (i.e., Site Assessment Plan [SAP] and/or Construction and Operation Plan [COP]) submittal comply with the vessel strike avoidance measures specified below except under extraordinary circumstances when complying with these requirements would put the safety of the vessel or crew at risk:

1. The Lessee must ensure that vessel operators and crews maintain a vigilant watch for cetaceans, pinnipeds, and sea turtles and slow down or stop their vessel to avoid striking protected species.
2. The Lessee must ensure that all vessel operators comply with 10 knot (18.5 kilometers per hour [km/hr]) speed restrictions in any Dynamic Management Area (DMA).
3. The Lessee must ensure that all vessels operating in the mid-Atlantic Seasonal Management Area (SMA) from November 1 through April 30 operate at speeds of 10 knots (18.5 km/hr) or less.
4. The Lessee must ensure that vessels 19.8 meters (65 feet) in length or greater, operating from November 1 through April 30, operate at speeds of 10 knots (18.5 km/hr) or less.
5. The Lessee must ensure that all vessel operators reduce vessel speed to 10 knots or less when mother/calf pairs, pods, or large assemblages of non-delphinoid cetaceans are observed near an underway vessel.

6. North Atlantic right whales.

   a. The Lessee must ensure all vessels maintain a separation distance of 500 meters (1,640 feet) or greater from any sighted North Atlantic right whale.

   b. The Lessee must ensure that the following avoidance measures are taken if a vessel comes within 500 meters (1,640 feet) of any North Atlantic right whale:

      i. If underway, any vessel must steer a course away from any North Atlantic right whale at 10 knots (18.5 km/h) or less until the 500-meter (1,640-foot) minimum separation distance has been established (unless ii below applies).
      ii. If a North Atlantic right whale is sighted within 100 meters (328 feet) of an underway vessel, the vessel operator must immediately reduce speed and promptly shift the engine to neutral. The vessel operator must not engage the engines until the North Atlantic right whale has moved beyond 100 meters (328 feet), at which point the vessel operator must comply with 6.b.i above.
      iii. If a vessel is stationary, the vessel must not engage engines until the North Atlantic right whale has moved beyond 100 meters (328 feet), at which point the Lessee must comply with 6.b.i above.

7. Non-delphinoid cetaceans other than the North Atlantic right whale.

   a. The Lessee must ensure that all vessels maintain a separation distance of 100 meters (328 feet) or greater from any sighted non-delphinoid cetacean.

   b. The Lessee must ensure that the following avoidance measures are taken if a vessel comes within 100 meters (328 feet) of a non-delphinoid cetacean:

      i. If any non-delphinoid cetacean is sighted, the vessel underway must reduce speed and shift the engine to neutral, and must not engage the engines until the non-delphinoid cetacean has moved beyond 100 meters (328 feet).
      ii. If a vessel is stationary, the vessel must not engage engines until the non-delphinoid cetacean has moved beyond 100 meters (328 feet).

8. Delphinoid cetaceans and pinnipeds.

   a. The Lessee must ensure that all vessels underway do not divert to approach any delphinoid cetacean and/or pinniped.

   b. The Lessee must ensure that if a delphinoid cetacean and/or pinniped approaches any vessel underway, the vessel underway must avoid excessive speed or abrupt changes in direction to avoid injury to the delphinoid cetacean and/or pinniped.

9. Sea Turtles.

   a. The Lessee must ensure that all vessels maintain a separation distance of 50 meters (164 feet) or greater from any sighted sea turtle.

B.2. MARINE TRASH AND DEBRIS PREVENTION

Marine debris prevention measures are intended to reduce the risk marine debris poses to protected species from ingestion and entanglement. These simple measures will reduce the potential for debris ending up in the marine environment.

The Lessee must ensure that vessel operators, employees, and contractors actively engaged in activity in support of plan (i.e., SAP and/or COP) submittal are briefed on marine trash and debris awareness and elimination, as described in the Bureau of Safety and Environmental Enforcement (BSEE) Notice to Lessee (NTL) No. 2012-G01 ("Marine Trash and Debris Awareness and Elimination") or any NTL that supersedes this NTL, except that the Lessor will not require the Lessee, vessel operators, employees, and contractors to undergo formal training or post placards. The Lessee must ensure that these vessel operator employees and contractors are made aware of the environmental and socioeconomic impacts associated with marine trash and debris and their responsibilities for ensuring that trash and debris are not intentionally or accidentally discharged into the marine environment. The above-referenced NTL provides information the Lessee may use for this awareness training.

B.3. GEOLOGICAL AND GEOPHYSICAL (G&G) SURVEY REQUIREMENTS

The Lessee must ensure that all vessels conducting activity in support of a plan (i.e., SAP and/or COP) submittal comply with the geological and geophysical survey requirements specified below except under extraordinary circumstances when complying with these requirements would put the safety of the vessel or crew at risk.

Visibility. The Lessee must not conduct G&G surveys in support of plan (i.e., SAP and/or COP) submittal at any time when lighting or weather conditions (e.g., darkness, rain, fog, sea state) prevent visual monitoring of the exclusion zones for high-resolution geophysical (HRG) surveys and geotechnical surveys as specified below. This requirement may be modified as specified below.

Modification of Visibility Requirement. If the Lessee intends to conduct G&G survey operations in support of plan submittal at night or when visual observation is otherwise impaired, the Lessee must submit to the Lessor an alternative monitoring plan detailing the alternative monitoring methodology (e.g., active or passive monitoring technologies). The alternative monitoring plan must demonstrate the effectiveness of the methodology proposed to the Lessor's satisfaction. The Lessor may, in consultation with NMFS, decide to allow the Lessee to conduct G&G surveys in support of plan submittal at night or when visual observation is otherwise impaired using the proposed alternative monitoring methodology.

Protected-Species Observer (PSO). The Lessee must ensure that the exclusion zone for all G&G surveys performed in support of plan (i.e., SAP and/or COP) submittal is monitored by NMFS-approved PSOs around the sound source. The number of PSOs must be sufficient to effectively monitor the exclusion zone at all times. In order to ensure effective monitoring, observers must not be on watch for more than 4 consecutive hours, with at least a 2-hour break after a 4-hour watch, unless otherwise accepted by BOEM. Observers must not work for more than 12 hours of any 24-hour period. The Lessee must provide to the Lessor a list of observers and their résumés no later than 45 calendar days prior to the scheduled start of surveys performed in support of plan submittal. The résumés of any additional observers must be provided at least 15 calendar days prior to each observer's start date. The Lessor will send the observer information to NMFS for approval.

Observation Location. The Lessee must ensure that monitoring occurs from the highest available vantage point on the associated operational platform and allows for 360-degree scanning.

Optical Device Availability. The Lessee must ensure that reticle binoculars and other suitable equipment are available to each observer to adequately perceive and monitor protected marine species within the exclusion zone during surveys conducted in support of plan (i.e., SAP and/or COP) submittal.

B.3.1. High Resolution Geophysical (HRG) Survey Requirements

The following requirements will apply to all HRG surveys conducted in support of plan (i.e., SAP and/or COP) submittal where one or more acoustic sound sources are operating at frequencies below 200 kilohertz (kHz).

1. Establishment of Default HRG Survey Exclusion Zone. The Lessee must ensure a 200-meter radius exclusion zone for marine mammals and sea turtles. In the case of the North Atlantic right whale, the minimum separation distance of 500 meters (1,640 feet), as required under B.1.1, must be observed.
   i) The Lessee may not use HRG survey devices that emit sound levels that exceed the 180-decibel (dB) Level A harassment radius (200-meter) boundary without approval by the Lessor.
   ii) If the Lessor determines that the exclusion zone does not encompass the 180-dB Level A harassment radius, the Lessor may impose additional, relevant requirements on the Lessee including, but not limited to, required expansion of this exclusion zone.
2. Field Verification of HRG Survey Exclusion Zone. The Lessee must conduct field verification of the exclusion zone for the HRG survey equipment operating at frequencies below 200 kHz. The Lessee must take acoustic measurements at a minimum of two reference locations and in a manner that is sufficient to establish the following: source level (peak at 1 meter) and distance to the 180, 160, and 150 dB root mean square (RMS) re 1 micropascal (μPa) sound pressure level (SPL) isopleths as well as the 187 dB re 1μPa cumulative sound exposure level (cSEL). The Lessee must take such sound measurements at the reference locations at two depths (i.e., a depth at mid-water and a depth at approximately 1 meter [3.28 feet] above the seafloor). The Lessee must report the field verification results to the Lessor in the SAP and COP Survey Plans, unless otherwise authorized by the Lessor.
3. Modification of Exclusion Zone Per Lessee Request. The Lessee may use the results from its field verification to request modification of the exclusion zone for the specific HRG survey equipment under consideration. The Lessee must base any proposed new exclusion zone radius on the largest safety zone configuration of the target Level A or Level B harassment acoustic threshold zone as defined by NMFS. The Lessee must use this modified zone for all subsequent use of field-verified equipment. The Lessee may periodically reevaluate the modified zone using the field verification procedures described in B.3.1.2. The Lessee must obtain Lessor approval of any new exclusion zone before it is implemented.
4. Clearance of HRG Survey Exclusion Zone. The Lessee must ensure that active acoustic sound sources must not be activated until the PSO has reported the exclusion zone clear of all marine mammals and sea turtles for at least 60 minutes.
5. HRG Right Whale Critical Habitat Seasonal Restriction. The Lessee must ensure that, between November 1 and April 30, all HRG surveys within North Atlantic right whale

critical habitat will only operate sound sources at frequencies above 30 kHz, unless otherwise authorized by the Lessor.

6. HRG Survey Mid-Atlantic Seasonal Management Areas (SMAs) Right Whale Monitoring. The Lessee must ensure that between November 1 and April 30, vessel operators monitor NMFS North Atlantic Right Whale reporting systems (e.g., the Early Warning System, Sighting Advisory System, and Mandatory Ship Reporting System) for the presence of North Atlantic right whales during HRG survey operations.

7. Dynamic Management Area (DMA) Shutdown Requirement. The Lessee must ensure that vessels cease HRG survey activities within 24 hours of NMFS establishing a DMA in the Lessee's HRG survey area. HRG surveys may resume in the affected area as soon as the DMA has expired.

8. Electromechanical Survey Equipment Ramp-Up. The Lessee must ensure that, when technically feasible, a "ramp-up" of the electromechanical survey equipment occurs at the start or re-start of HRG survey activities. A ramp-up would begin with the power of the smallest acoustic equipment for the HRG survey at its lowest power output. The power output would be gradually turned up and other acoustic sources added in a way such that the source level would increase in steps, not exceeding 6 dB per 5-minute period.

9. Shutdown for Non-Delphinoid Cetaceans and Sea Turtles. If a non-delphinoid cetacean or sea turtle is sighted at or within the exclusion zone, an immediate shutdown of the electromechanical survey equipment is required. The Lessee must ensure that the vessel operator immediately complies with such a call by the PSO. Any disagreement or discussion must occur only after shutdown. Subsequent restart of the electromechanical survey equipment may only occur following clearance of the exclusion zone of all marine mammals and sea turtles for at least 60 minutes (in B.3.1.4) and must use the ramp-up provisions described in B.3.1.8.

10. Power Down for Delphinoid Cetaceans and Pinnipeds. If a delphinoid cetacean or pinniped is sighted at or within the exclusion zone, the electromechanical survey equipment must be powered down to the lowest power output that is technically feasible. The Lessee must ensure that the vessel operator immediately complies with such a call by the PSO. Any disagreement or discussion must occur only after power down. Subsequent power up of the electromechanical survey equipment must use the ramp-up provisions described in B.3.1.8 and may occur after (1) the exclusion zone is clear of delphinoid cetaceans and pinnipeds or (2) a determination by the PSO after a minimum of 10 minutes of observation that the delphinoid cetacean or pinniped is approaching the vessel or towed equipment at a speed and vector that indicates voluntary approach to bow-ride or chase towed equipment.

11. Pauses in Electromechanical Survey Sound Source. The Lessee must ensure that if the electromechanical sound source shuts down for reasons other than encroachment into the exclusion zone by a non-delphinoid cetacean or sea turtle, including reasons such as, but not limited to, mechanical or electronic failure, and such shutdown results in the cessation of the sound source for a period greater than 20 minutes, the Lessee must restart the electromechanical survey equipment using the ramp-up provisions (in B.3.1.8) and clearance of the exclusion zone of all marine mammals and sea turtles for at least 60 minutes (in B.3.1.2). If the shutdown is less than 20 minutes, the Lessee may restart the equipment as soon as practicable as long as the Lessee has continued visual surveys diligently throughout the silent period and the exclusion zone remained clear of all marine mammals and sea turtles. If the Lessee has not continued visual surveys diligently during a

shutdown of 20 minutes or less, the Lessee must restart the electromechanical survey equipment following the clearance of the exclusion zone of all marine mammals and sea turtles for at least 60 minutes (in B.3.1.4) and must use the ramp-up provisions described in B.3.1.8.

B.3.2 Geotechnical Exploration Requirements

The following requirements will apply to geotechnical exploration limited to borings and vibracores and conducted in support of plan (i.e., SAP and/or COP) submittal.

1. Establishment of Default Exclusion Zone. The Lessee must ensure that a PSO monitors the 200-meter (656-foot) radius exclusion zone for all marine mammals and sea turtles around any vessel conducting geotechnical surveys.

2. Modification of Default Geotechnical Exclusion Zone Per Lessee Request. If the Lessee wishes to modify the 200-meter (656-foot) default exclusion zone for specific geotechnical exploration equipment, the Lessee must submit a plan for verifying the sound source levels of the specific geotechnical exploration equipment to the Lessor. The plan must demonstrate how the field verification activities will comply with the requirements of B.3.2.3. The Lessor may require that the Lessee modify the plan to address any comments the Lessor submits to the Lessee on the contents of the plan in a manner deemed satisfactory to the Lessor prior to the commencement of field verification activities. Any new exclusion zone radius proposed by the Lessee must be based on the largest safety zone configuration of the target Level A or Level B harassment acoustic threshold zone as defined by NMFS. The Lessee must use this modified zone for all subsequent use of field-verified equipment. The Lessee may periodically reevaluate the modified zone using the field verification procedures described in B.3.2.3. The Lessee must obtain Lessor approval of any new exclusion zone before it is implemented.

3. Field Verification of Geotechnical Exclusion Zone. If the Lessee wishes to modify the existing exclusion zone, the Lessee must conduct field verification of the exclusion zone for specific geotechnical exploration equipment. The Lessee must use the results of the sound measurements from the survey equipment to establish a new exclusion zone, which may be greater than or less than the 200-meter (656-foot) default exclusion zone depending on the results of the field tests. As part of such field verification, the Lessee must take acoustic measurements at a minimum of two reference locations and in a manner that is sufficient to establish the following: source level (peak at 1 meter) and distance to the 180, 160, and 150 dB (RMS) re 1µPa SPL isopleths as well as the 187 dB re 1µPa cSEL. The Lessee must take these sound measurements at the reference locations at two depths (i.e., a depth at mid-water and a depth at approximately 1 meter above the seafloor).

4. Clearance of Geotechnical Exclusion Zone. The Lessee must ensure that geotechnical sound sources must not be activated until the PSO has reported the exclusion zone clear of all marine mammals and sea turtles for at least 60 minutes.

5. Shutdown for Non-Delphinoid Cetaceans and Sea Turtles. If any non-delphinoid cetaceans or sea turtles are sighted at or within the exclusion zone, the Lessee must immediately shut down the geotechnical survey equipment. The vessel operator must comply immediately with such a call by the observer. Any disagreement or discussion should occur only after shutdown. Subsequent restart of the geotechnical survey equipment may only occur

following clearance of the exclusion zone for at least 60 minutes for all marine mammals and sea turtles (in B.3.1.4).

6. Pauses in Geotechnical Exploration Sound Source. If the geotechnical sound source shuts down for reasons other than encroachment into the exclusion zone by a non-delphinoid cetacean or sea turtle, including reasons such as, but not limited to, mechanical or electronic failure, resulting in the cessation of the sound source for a period greater than 20 minutes, the Lessee must ensure clearance of the exclusion zone of all cetaceans, pinnipeds, and sea turtles for at least 60 minutes (in B.3.1.4). If the shutdown is less than 20 minutes, the Lessee may restart the equipment as soon as practicable as long as the Lessee has continued visual surveys diligently throughout the silent period and the exclusion zone remained clear of marine mammals and sea turtles. If the Lessee has not continued visual surveys diligently during a shutdown of 20 minutes or less, the Lessee must restart the geotechnical exploration equipment only after the clearance of the exclusion zone of all marine mammals and sea turtles for at least 60 minutes (in B.3.1.4).

B.4. PROTECTED SPECIES REPORTING REQUIREMENTS

The Lessee must ensure compliance with the following reporting requirements for site characterization activities performed in support of plan (i.e., SAP and/or COP) submittal and must use the contact information provided as an enclosure to this appendix, or updated contact information as provided by the Lessor, to fulfill these requirements:

1. Field Verification Plan for HRG Survey Exclusion Zone. No later than 45 days prior to the commencement of the field verification activities, the Lessee must submit a plan for verifying the sound source levels of any electromechanical survey equipment operating at frequencies below 200 kHz to the Lessor. The plan must demonstrate how the field verification activities will comply with the requirements of B.3.1.2. Prior to the commencement of the field verification activities, the Lessor may require that the Lessee modify the plan to address any comments the Lessor submits to the Lessee on the contents of the plan in a manner deemed satisfactory to the Lessor.

2. Field Verification of Exclusion Zone Preliminary Report for HRG Survey Equipment. The Lessee must ensure that the results of the field verification are reported to BOEM and NMFS prior to the HRG equipment being used for project-related activities. The Lessee must include in its report a preliminary interpretation of the results for all sound sources, which will include details of the operating frequencies, sound pressure levels (RMS), received cSELs, and frequency bands covered, as well as associated latitude/longitude positions, ranges, depths and bearings between sound sources and receivers.

3. Reporting Injured or Dead Protected Species. The Lessee must ensure that sightings of any injured or dead protected species (e.g., marine mammals, sea turtles, or sturgeon) are reported to the Lessor, NMFS, and the NMFS Northeast Region Stranding Hotline within 24 hours of sighting, regardless of whether the injury or death is caused by a vessel. In addition, if the injury or death was caused by a collision with a project-related vessel, the Lessee must notify the Lessor of the strike within 24 hours. The Lessee must use the form provided in Attachment 1 of this appendix to report the sighting or incident. If the Lessee's activity is responsible for the injury or death, the Lessee must ensure that the vessel assists in any salvage effort as requested by NMFS.

4. Reporting Observed Impacts on Protected Species.

   c. The Lessee must report any observed take of listed marine mammals, sea turtles, or sturgeon to the Lessor and the NMFS Northeast Region Stranding Hotline within 48 hours.

   d. The Lessee must record injuries or mortalities using the form provided in Attachment 1 of this appendix.

5. Protected-Species Observer Reports. The Lessee must ensure that the PSO record all observations of protected species using standard marine mammal observer data collection protocols. The list of required data elements for these reports is provided in Attachment 2 of this appendix.

6. Reports of G&G Survey Activities and Observations. The Lessee must provide BOEM and NMFS with reports every 90 calendar days following the commencement of HRG and/or geotechnical exploration activities, and a final report at the conclusion of the HRG and/or geotechnical exploration activities. Each report must include a summary of survey activities, all PSO and incident reports (see Attachments 1 and 2), a summary of the survey activities, and an estimate of the number of listed marine mammals and sea turtles observed and/or taken during these survey activities.

7. Marine Mammal Protection Act Authorization(s). If the Lessee is required to obtain an authorization pursuant to section 101(a)(5) of the Marine Mammal Protection Act prior to conducting survey activities, the Lessee must provide to the Lessor a copy of such authorization prior to commencing survey activities.

Attachment 1 to Appendix B

Protected Species Incident Reporting Form

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF OCEAN ENERGY MANAGEMENT

Incident Report: Protected Species Injury or Mortality

Photographs/Video should be taken of all injured or dead animals.

Observer's full name: ______________________________

Reporter's full name: ______________________________

Species Identification: ______________________________

Name and type of platform: ______________________________

Date animal observed: ______________ Time animal observed: ______________

Date animal collected: ______________ Time animal collected: ______________

Environmental conditions at time of observation (e.g., tidal stage, Beaufort Sea State, weather):

____

____

Water temperature (°C) and depth (m/ft) at site: ______________________________

Describe location of animal and events 24 hours leading up to, including and after, the incident (including vessel speeds, vessel activity and status of all sound source use): ______________

____

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____

Photograph/Video taken: YES / NO If Yes, was the data provided to NMFS? YES / NO
(Please label *species, date, geographic site* and *vessel name* when transmitting photo and/or video)

Date and Time reported to NMFS Stranding Hotline: ______________________________

Sturgeon Information: *(please designate cm/m or inches and kg or lbs)*

Species: ______________________________

Fork length (or total length): ______________ Weight: ______________

Condition of specimen/description of animal: ______________________________

____

____

Fish Decomposed: NO SLIGHTLY MODERATELY SEVERELY

Fish tagged: YES / NO If Yes, *please record all tag numbers.*

Tag #(s):____

Genetic samples collected: YES / NO

Genetics samples transmitted to:____________________on____/_____/20….

<u>Sea Turtle Species Information</u>: *(please designate cm/m or inches)*

Species:____________________Weight (kg or lbs):____________________

Sex: Male Female Unknown

How was sex determined?:____

Straight carapace length:____________________Straight carapace width:____________________

Curved carapace length:____________________Curved carapace width:____________________

Plastron length:____________________Plastron width:____________________

Tail length:____________________Head width:____________________

Condition of specimen/description of animal:____

____

____

Existing Flipper Tag Information

Left:____________________Right:____________________

PIT Tag#:____

Miscellaneous:

Genetic biopsy collected: YES / NO Photographs taken: YES / NO

Turtle Release Information:

Date:____________________Time:____________________

Latitude:____________________Longitude:____________________

State:____________________County:____________________

Remarks: (note if turtle was involved with tar or oil, gear or debris entanglement, wounds, or mutilations, propeller damage, papillomas, old tag locations, etc.)____________________

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<u>Marine Mammal information</u>: *(please designate cm/m or ft/inches)*

Length of marine mammal (note direct or estimated): ____

Weight (*if possible, kg or lbs*):____

Sex of marine mammal (if possible):____

How was sex determined?:____

Confidence of Species Identification: SURE UNSURE BEST GUESS

Description of Identification characteristics of marine mammal:_______________________________

____

____

____

____

Genetic samples collected: YES / NO

Genetic samples transmitted to:____on_____/______/20….

Fate of marine mammal:____

____

____

____

Description of Injuries Observed:____

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Other Remarks/Drawings:____

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Attachment 2 to Appendix B
Protected Species List of Required Data Elements

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF OCEAN ENERGY MANAGEMENT

Required Data Elements for Protected Species Observer Reports

The Lessee must ensure that the Protected-Species Observer record all observations of protected species using standard marine mammal observer data collection protocols. The list of required data elements for these reports is provided below:

1) Vessel name;
2) Observer names and affiliations;
3) Date;
4) Time and latitude/longitude when visual survey began;
5) Time and latitude/longitude when visual survey ended; and
6) Average environmental conditions during visual surveys including:
    a) Wind speed and direction;
    b) Sea state (glassy, slight, choppy, rough, or Beaufort scale);
    c) Swell (low, medium, high, or swell height in meters); and
    d) Overall visibility (poor, moderate, good);
7) Species (or identification to lowest possible taxonomic level);
8) Certainty of identification (sure, most likely, best guess);
9) Total number of animals;
10) Number of juveniles;
11) Description (as many distinguishing features as possible of each individual seen, including length, shape, color and pattern, scars or marks, shape and size of dorsal fin, shape of head, and blow characteristics);
12) Direction of animal's travel – related to the vessel's direction of travel (preferably associated with a drawing);
13) Behavior (as explicit and detailed as possible; note any observed changes in behavior); and
14) Activity of vessel when sighting occurred.

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Enclosure to Appendix B

Contact Information for Reporting Requirements

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF OCEAN ENERGY MANAGEMENT

Contact Information For Reporting Requirements

The following contact information must be used for the reporting and coordination requirements specified in the EA:

United States Fleet Forces (USFF) N46
1562 Mitscher Ave, Suite 250
Norfolk, VA 23551
(757) 836-6206

The following contact information must be used for the reporting requirements specified in the EA:

Reporting Injured or Dead Protected Species

NOAA Fisheries Northeast Region Stranding Hotline: **866-755-6622**
Collected dead sea turtles and/or Atlantic Sturgeon: Fax: 978-281-9394 or e-mail: incidental.take@noaa.gov; renewable_reporting@boem.gov

All other reporting requirements

Bureau of Ocean Energy Management
Environment Branch for Renewable Energy
Phone: 703-787-1340
Email: renewable_reporting@boem.gov

National Marine Fisheries Service
Northeast Regional Office, Protected Resources Division
Section 7 Coordinator
Phone: 978-281-9328
Email: incidental.take@noaa.gov; kellie.foster-taylor@noaa.gov

Vessel operators may send a blank email to ne.rw.sightings@noaa.gov for an automatic response listing of all current DMAs.

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APPENDIX C
VESSEL TRIP CALCULATIONS

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Table C-1
HRG Survey and Cable Vessel Trips

WEA	OCS Blocks	Amount of Time to conduct HRG Surveys by OCS Block[1]	Amount of Time to conduct HRG Cable Surveys by OCS Block[2]	Total Number of Days/Vessel Round Trips
Alternative A				
Kitty Hawk	21.5	236.5	1	237.5
Wilmington-East	25	275	1	276
Wilmington-West	9	99	1	100
Total	**55**	**610**	3	**613**
Alternative B				
Kitty Hawk	21.5	236	1	237
Wilmington-East	25	275	1	276
Total	**46**	**511**	**2**	**512**
Alternative C				
Kitty Hawk	21	236	1	237
Wilmington-East	25	275	1	276
Wilmington-West	9	99	1	100
Total	**55**	**610**	**3**	**613**

[1] Assumes the survey time for one OCS block takes 11 days.
[2] Assumes one round-trip vessel for each cable route.

Table C-2
Geotechnical Sampling/Sub-bottom Sampling Survey Vessel Trips

WEA	OCS Blocks	Approximate Number of Sub-bottom Samples by OCS Block[1]	Approximate Number of Sub-bottom Samples per nm of cable	Approximate Number of Sub-bottom Samples by Meteorological Tower or Buoy	Total Number of Days and Round Trips
Alternative A					
Kitty Hawk	21	430	34	3	434
Wilmington-East	25	500	30	3	504
Wilmington-West	9	180	21	3	184
Total	**55**	**1110**	**85**	**9**	**1122**
Alternative B					
Kitty Hawk	21.5	430	34	3	**467**
Wilmington-East	25	500	30	3	**533**
Total	**46.5**	**930**	**64**	**6**	**998**
Alternative C					
Kitty Hawk	21.5	430	34	3	434
Wilmington-East	25	500	30	3	504
Wilmington-West	9	180	21	3	184
Total	**55.5**	**1110**	**85**	**9**	**1122**

[1] Assumes 20 wind turbines per OCS block.

Table C-3
Avian Surveys Vessel Trips

Alternative/WEAs	OCS Blocks	Survey Days/Vessel Trips[1]	Total Survey Days/Vessel Round Trips over 2–3 Years
Alternative A			
Kitty Hawk	21.5	3 days	72–108 days/vessel trips
Wilmington West	9	1 day	24–36 days/vessel trips
Wilmington East	25	3 days	72–108 days/vessel trips
Total	55.5	7 days	171–252 108 days/vessel trips
Alternative B			
Kitty Hawk	21.5	3 days	72–108 days/vessel trips
Wilmington East	25	3 days	72–108 days/vessel trips
Total	46.5	6 days	144–216 days/vessel trips
Alternative C			
Kitty Hawk	21.5	3 days	72–108 days/vessel trips
Wilmington West	9	1 day	24–36 days/vessel trips
Wilmington East	25	3 days	72–108 days/vessel trips
Total	55.5	7 days	171–252 108 days/vessel trips

[1] Assumes 10 OCS blocks can be covered in 1 day.

Table C-4
Fish Surveys Vessel Trips

Alternative	Baseline – Alt. A Max Surveys	Ratio to Alt A	Total Vessel Round Trips
Alternative A	60	1	60
Alternative B	60	0.6	36
Alternative C	60	1	60

Table C-5
Meteorological Buoys and Towers Vessel Trips

Site Assessment Activity	Meteorological Buoy Vessel Round Trips	Meteorological Towers Vessel Round Trips
Alternative A – All WEAs		
Meteorological Buoy Installation	6–12	120
Meteorological Buoy Quarterly–Monthly Maintenance Trips[1]	120–360	60–780
Meteorological Buoy Decommission	6–12	120
Total Buoy Trips Over 5-Year Period	*132–384*	*300–1,020*
Alternative B – All WEAs		
Meteorological Tower Construction	4–8	80
Meteorological Tower Quarterly–Weekly Maintenance Trips[1]	80–240	40–520
Meteorological Tower Decommission	4–8	80
Total Tower Trips Over 5-Year Period	*88–256*	*200–680*
Alternative C – All WEAs		
Meteorological Tower Construction	120	120
Meteorological Tower Quarterly–Weekly Maintenance Trips[1]	60–780	60–780
Meteorological Tower Decommission	120	120
Total Tower Trips Over 5-Year Period	*132–384*	*300–1,020*

[1] Although construction and decommissioning would occur during some of the weeks and, therefore, not all weeks would require maintenance trips for the towers, all weeks were included for maintenance to be conservative in the trip calculations.

Table C-6
Total Vessel Round Trips

Alternative/ WEA	OCS Blocks	HRG Surveys	Cable Surveys	Geotechnical Sampling Surveys	Avian Surveys	Fish Surveys	Meteorological Buoys	Meteorological Towers
Alternative A (Proposed Action)								
Kitty Hawk WEA	21.5	236	1	467	72–108	N/A	6–12	120
Wilmington East WEA	25	275	1	213	24–36	N/A	120–360	60–780
Wilmington West WEA	9	99	1	524	72–108	N/A	6–12	120
Total Alternative A	55.5	610	3	1204	171–252	60	132–384	300–1,020
Alternative B								
Kitty Hawk WEA	21.5	236	1	467	72–108	N/A	4–8	80
Wilmington East WEA	25	275	1	213	24–36	N/A	80–240	40–520
Total Alternative B	46.5	511	2	680	96–144	36	88–256	200–680
Alternative C								
Kitty Hawk WEA	21.5	236.5	1	467	72–108	N/A	6–12	120
Wilmington East WEA	25	275	1	213	24–36	N/A	120–360	60–780
Wilmington West WEA	9	99	1	524	72–108	N/A	6–12	120
Total Alternative C	55.5	610	3	1204	171–252	60	132–384	300–1,020

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APPENDIX D
AIR QUALITY EMISSIONS CALCULATIONS

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NOTE FOR APPENDIX D EMISSIONS CALCULATIONS

This appendix and its calculations are adapted from Appendix D of *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts: Revised Environmental Assessment* (the “MA/RI EA”), BOEM 2013-1131, May 2013. Available at: http://www.boem.gov/uploadedFiles/BOEM/Renewable_Energy_Program/State_Activities/BOEM%20RI_MA_Revised%20EA_22May2013.pdf. Assumptions, data, table footnotes, and references—other than NC-specific WEA locations, port locations, vessel trip volumes and distances—are taken from the MA/RI EA.

Action Alternative	Activity	CO	NOx	VOCs	PM10	PM2.5	SOx
A	Site Characterization Surveys	3.50	37.99	1.46	2.07	2.07	3.74
	Site Assessment: Construction of Meteorological Towers*	0.36	2.11	0.43	0.14	0.14	0.20
	Site Assessment: Operation of Meteorological Towers	4.03	22.04	1.85	1.47	1.47	1.64
	Site Assessment: Decommissioning of Meteorological Towers*	0.36	2.75	0.44	0.16	0.17	0.27
	Sum of emissions from all sources - Alt. A	8.26	64.89	4.18	3.85	3.85	5.86
B	Site Characterization Surveys	2.00	21.45	0.83	1.17	1.17	2.11
	Site Assessment: Construction of Meteorological Towers*	0.29	1.99	0.41	0.13	0.13	0.19
	Site Assessment: Operation of Meteorological Towers	2.69	14.70	1.34	0.98	0.98	1.10
	Site Assessment: Decommissioning of Meteorological Towers*	0.24	1.83	0.40	0.11	0.11	0.18
	Sum of emissions from all sources - Alt. B	5.22	39.97	2.97	2.39	2.39	3.58
C	All	All values same as Alternative A					

Emissions Summary for Average Year -- Alternative A or C

Phase/Source Description	Emissions (tons/year, metric tons/year for GHG pollutants)								
	CO	NO_x	VOC	PM2.5	PM10	SO_x	CO_2	N_2O	CH_4
Site Characterization - Staff Commuting for Surveys									
- POVs	0.34	1.52E-02	2.03E-02	1.18E-03	2.03E-03	8.45E-04	28.21	2.76E-04	1.33E-03
Site Characterization - Offshore Surveys									
- Vessel Travel	3.16	38.0	1.44	2.07	2.07	3.74	1,800.6	0.05	0.23
- Fuel Spills	-	-	0.31	-	-	-	-	-	-
SUBTOTAL One year from Years 1-5	**3.50**	**38.0**	**1.46**	**2.07**	**2.07**	**3.74**	**1,828.8**	**0.05**	**0.24**
Site Assessment - Onshore Tower Construction									
- POVs	5.46E-02	8.55E-03	8.17E-03	1.10E-03	1.69E-03	5.81E-04	29.93	9.57E-05	1.93E-04
- Construction Equipment	0.10	0.22	2.30E-02	2.92E-02	2.92E-02	1.92E-02	12.21	3.58E-04	2.21E-02
Site Assessment - Offshore Tower Construction									
- Vessel Travel	0.15	1.76	0.07	0.10	0.10	0.17	83.5	2.42E-03	1.09E-02
- Construction Equipment	0.06	0.12	1.52E-02	1.64E-02	1.64E-02	1.06E-02	5.72	1.68E-04	1.04E-02
- Fuel Spills	-	-	0.31	-	-	-	-	-	-
Site Assessment - Onshore O&M									
- POVs	4.10E-02	1.86E-03	2.48E-03	1.44E-04	2.48E-04	1.03E-04	3.44	3.37E-05	1.62E-04
Site Assessment - Offshore O&M									
- Vessel Travel	0.48	5.75	0.22	0.31	0.31	0.57	272.6	7.90E-03	3.56E-02
- Generators	3.51	16.29	1.32	1.16	1.16	1.08	515.0	-	-
- Fuel Spills	-	-	0.31	-	-	-	-	-	-
Site Assessment - Onshore Decommission									
- POVs	5.46E-02	8.55E-03	8.17E-03	1.10E-03	1.69E-03	5.81E-04	29.93	9.57E-05	1.93E-04
Site Assessment - Offshore Decommission									
- Vessel Travel	0.21	2.57	0.10	0.14	0.14	0.25	121.7	3.53E-03	1.59E-02
- Construction Equipment	0.10	0.17	2.21E-02	2.37E-02	2.37E-02	1.53E-02	12.72	3.73E-04	2.31E-02

Emissions Summary for Average Year -- Alternative A or C

Phase/Source Description	Emissions (tons/year, metric tons/year for GHG pollutants)								
	CO	NO_x	VOC	PM2.5	PM10	SO_x	CO_2	N_2O	CH_4
- Fuel Spills	-	-	0.31	-	-	-	-	-	-
SUBTOTAL One year from Years 1-5	**4.76**	**26.90**	**2.72**	**1.78**	**1.78**	**2.12**	**1,086.6**	**1.50E-02**	**0.12**
TOTAL Emissions from Average Year*	**8.26**	**64.9**	**4.18**	**3.85**	**3.85**	**5.86**	**2,915.4**	**0.07**	**0.35**

* Site characterization and site assessment activities may occur concurrently during the five years; therefore, a worst-case of the average years is modeled as a summation of a site characterization and site assessment year.
CO = carbon monoxide, NOx = nitrogen oxides, VOCs = volatile organic compounds, PM10 = particulate matter with aerodynamic diameters of 10 microns or less, PM2.5 = particulate matter with aerodynamic diameters of 2.5 microns or less, SOx = sulfur oxides, CO_2 = carbon dioxide, N_20 = nitrogen dioxide, CH_4 = methane

Emissions Summary for Average Year -- Alternative B

Phase/Source Description	Emissions (tons/year, metric tons/year for GHG pollutants)								
	CO	NO_x	VOC	PM2.5	PM10	SO_x	CO_2	N_2O	CH_4
Site Characterization - Staff Commuting for Surveys									
- POVs	0.22	9.81E-03	1.31E-02	7.63E-04	1.31E-03	5.45E-04	20.06	1.96E-04	9.43E-04
Site Characterization - Offshore Surveys									
- Vessel Travel	1.79	21.4	0.81	1.17	1.17	2.11	1,016.7	0.03	0.13
- Fuel Spills	-	-	0.31	-	-	-	-	-	-
SUBTOTAL One year from Years 1-5	**2.00**	**21.4**	**0.83**	**1.17**	**1.17**	**2.11**	**1,036.7**	**0.03**	**0.13**
Site Assessment - Onshore Tower Construction									
- POVs	3.64E-02	5.70E-03	5.45E-03	7.37E-04	1.12E-03	3.87E-04	19.95	6.38E-05	1.29E-04
- Construction Equipment	0.06	0.15	1.54E-02	1.95E-02	1.95E-02	1.28E-02	8.14	2.38E-04	1.48E-02
Site Assessment - Offshore Tower Construction									
- Vessel Travel	0.15	1.76	0.07	0.10	0.10	0.17	83.5	2.42E-03	1.09E-02
- Construction Equipment	0.04	0.08	1.01E-02	1.09E-02	1.09E-02	7.06E-03	3.81	1.12E-04	6.92E-03
- Fuel Spills	-	-	0.31	-	-	-	-	-	-
Site Assessment - Onshore O&M									
- POVs	2.73E-02	1.24E-03	1.65E-03	9.63E-05	1.65E-04	6.88E-05	2.30	2.25E-05	1.08E-04
Site Assessment - Offshore O&M									
- Vessel Travel	0.32	3.83	0.15	0.21	0.21	0.38	181.7	5.27E-03	2.37E-02
- Generators	2.34	10.86	0.88	0.77	0.77	0.72	343.3	-	-
- Fuel Spills	-	-	0.31	-	-	-	-	-	-
Site Assessment - Onshore Decommission									

Emissions Summary for Average Year -- Alternative B

Phase/Source Description	Emissions (tons/year, metric tons/year for GHG pollutants)								
	CO	NO_x	VOC	PM2.5	PM10	SO_x	CO_2	N_2O	CH_4
- POVs	3.64E-02	5.70E-03	5.45E-03	7.37E-04	1.12E-03	3.87E-04	19.95	6.38E-05	1.29E-04
Site Assessment - Offshore Decommission									
- Vessel Travel	0.14	1.71	0.06	0.09	0.09	0.17	81.1	2.35E-03	1.06E-02
- Construction Equipment	0.06	0.12	1.47E-02	1.58E-02	1.58E-02	1.02E-02	8.48	2.48E-04	1.54E-02
- Fuel Spills	-	-	0.31	-	-	-	-	-	-
SUBTOTAL One year from Years 1-5	**3.22**	**18.52**	**2.15**	**1.22**	**1.22**	**1.47**	**752.2**	**1.08E-02**	**0.08**
TOTAL Emissions from Average Year*	**5.22**	**40.0**	**2.97**	**2.39**	**2.39**	**3.58**	**1,789.0**	**0.04**	**0.22**

* Site characterization and site assessment activities may occur concurrently during the five years; therefore, a worst-case of the average years is modeled as a summation of a Site characterization and site assessment year.

Site Characterization Activities

Onshore Activities - Staff Commuting to Job Site

Personal Vehicle Round Trips for Vessel Trips Associated with Site Characterization Activities

Survey Task	Alternative A or C				Alternative B			
	Total No. of Vessel Round Trips	Duration of Survey Task (years)	No. of Vessel Round Trips (per year)[1]	No. of POV Round Trips (per year)[2]	Total No. of Vessel Round Trips	Duration of Survey Task (years)	No. of Vessel Round Trips (per year)[1]	No. of POV Round Trips (per year)[2]
HRG Survey of OCS blocks within WEA	610	5	122	366	511	5	102	307
HRG surveys of 3 cable routes	3	5	1	2	2	5	0	1
Geotechnical Sampling	1,204	5	241	722	680	5	136	408
Avian surveys (max. of 171-252 range)	252	5	50	151	144	5	29	86
Fish surveys	60	5	12	36	36	5	7	22
TOTAL	**2,130**	**--**	**426**	**1,278**	**1,374**	**--**	**275**	**824**

1. Round trips per year estimated by dividing total round trips per task by the number of years over which the surveys will be conducted.
2. Assume an average of three staff per vessel. Therefore, personal vehicle (POV) round trips assumed to equal three times the number of vessel round trips per year.

Personal Vehicle Emission Factors[1]

Personal Vehicle Type	Model Year[2]	Calendar Year[2]	Emission Factors (grams/mile)								
			CO	NOx	VOC	PM2.5[3]	PM10[3]	SOx	CO_2	N_2O	CH_4
Light Duty Gasoline Vehicles	2009	2015	3.97	0.18	0.24	0.014	0.024	0.01	368.00	3.60E-03	1.73E-02

Personal Vehicle Emissions -- Average Year Over 5 Years

Personal Vehicle Type	Total No. of Round Trips	Total Miles (per trip)[4]	Emission (tons/year, metric tons/year for GHG pollutants)								
			CO	NOx	VOC	PM2.5	PM10	SOx	CO_2	N_2O	CH_4

Light Duty Gasoline Vehicles - Alt. A or C	1,278	60	**0.34**	**1.52E-02**	**2.03E-02**	**1.18E-03**	**2.03E-03**	**8.45E-04**	**28.21**	**2.76E-04**	**1.33E-03**
Light Duty Gasoline Vehicles - Alt. B	824	60	**0.22**	**9.81E-03**	**1.31E-02**	**7.63E-04**	**1.31E-03**	**5.45E-04**	**20.06**	**1.96E-04**	**9.43E-04**

1. Emission factors and methodology from Air Emissions Factor Guide to Air Force Mobile Sources, December 2009, Section 4. Emission Factors for N_2O and CH_4 obtained from the Federal Greenhouse Gas Accounting and Reporting Guidance Technical Support Document (2010), Table D-1, for Tier 2 gasoline passenger cars.
2. Assume staff drive Light Duty Gasoline Vehicles, with average of Model Year 2009 in Calendar Year 2015. CY2015 is the latest year provided in the guidance, and provides an approximate median year for the project.
3. Emission factors for PM2.5 an PM10 include fugitive sources of PM from brake and tire.
4. Assume each employee drives 60 miles round trip.

Site Characterization Activities

Calculation of HRG Survey Vessel-Hours			
HRG Survey of OCS Blocks			
Length of surveys per OCS block (nm)			500
Vessel speed (kt)			4.5
Survey time required per OCS block (hr)			111
Survey period duration (yr)			5
Results by WEA	Kitty Hawk	Wilm. E.	Wilm. W.
No. of OCS blocks	21.5	25	9
Vessel-hours required	2,389	2,778	1,000
Vessel-hours required/yr	478	556	200
Results by EA Alternative	A	B	C
Vessel-hours required	6,167	5,167	6,167
Vessel-hours required/yr	1,233	1,033	1,233
HRG Survey of			

Distances to Nearest Ports for Vessel Distance Calculations				
	Approx. Distance (nm round trip)			
Port	Kitty Hawk	Wilm. E.	Wilm. W.	Avg. Wilm. E&W
Norfolk	169	584	604	594
Wilmington	442	57	57	57
Charleston	634	204	224	214
Wanchese	55	358	378	368
Port of Morehead City, NC	330	178	196	187
Southport Marina, NC	490	74	42	58
Hatteras Harbor Marina, NC	166	312	288	300
Port of Georgetown, NC	636	176	136	156
For Wilm. E&W only: Avg. 3 nearest ports		100	80	90
Avg. Distances by Alt. (weighted by no. of blocks)				
Alt. A & C	123			
Alt. B	95			

Site Characterization Activities

Cable Routes			
Line spacing (m)			30
Cable corridor width (m)			300
No. of survey lines = Survey miles/corridor mile (nm)			10
Results by WEA	Kitty Hawk	Wilm. E.	Wilm. W.
Cable corridor length (nm)	33.3	20.5	29.8
Total survey distance (nm)	333	205	298
Vessel-hours required	1,499	923	1,341
Vessel-hours required/yr	300	185	268
Results by EA Alternative	A	B	C
Vessel-hours required	3,762	2,421	3,762
Vessel-hours required/yr	752	484	752

Site Characterization Activities

Offshore Activities - Surveys

Survey Vessel Details

Survey Task	Vessel Type	Alternative A or C						Alternative B					
		Total No. of Vessel Round Trips	Duration of Survey Task (years)	No. of Vessel Round Trips (per year)[2]	Avg. Miles Per Round Trip (nautical miles)	Total (nautical miles/yr)[3]	Activity (hrs/yr)[4]	Total No. of Vessel Round Trips	Duration of Survey Task (years)	No. of Vessel Round Trips (per year)[2]	Avg. Miles Per Round Trip (nautical miles)	Total (nautical miles/yr)[3]	Activity (hrs/yr)[4]
HRG Survey of OCS blocks within WEA	Crew Boat	610	5	122	-	5,550	1,233	511	5	102	-	4,650	1,033
HRG surveys of 3 cable routes	Crew Boat	3	5	0.6	-	3,386	752	2	5	0	-	2,179	752
Geotechnical Sampling[1]	Small Tug Boat	1,204	5	241	123	29,736	2,478	680	5	136	95	12,880	1,073
Geotechnical Sampling[1]	Cargo Barge	1,204	5	241	123	29,736	2,478	1,204	5	241	95	22,805	1,900
Avian surveys (max. of 171-252 trips range)	Crew Boat	252	5	50	123	6,224	346	144	5	29	95	2,728	152
Fish Surveys	Crew Boat	60	5	12	123	1,482	82	36	5	7	95	682	38

1. Assume all round trips over the 3 year period were performed using Small Tug Boat in conjunction with small Cargo Barge, which does not have an engine. Assume all Avian surveys completed by boat to obtain worst case scenario.
2. Round trips per year estimated by dividing total round trips per task by the number of years over which the surveys will be conducted.
3. Distances for HRG Survey and HRG Survey Cable Routes are based on vessel-hours and speed. Distances for other surveys based on calculated round trips multiplied by average round trip nm.
4. Assume an average speed of 4.5 knots for HRG surveys, 12 knots for the tug boats/barges, and 18 knots for crew boats to estimate Activity hours based upon Total nautical miles traveled. No time for the vessels spent at idle at the towers was captured in this calculation. http://www.scrutonmarine.com/Crew%20Boats.htm and http://www.chacha.com/question/what-is-the-average-top-speed-of-a-tug-boat

Emission Factors for Vessels

Vessel Type	Engine Size (hp)	Engine Power (kW)[1]	Load Factor (%)[2]	Emission Factors (g/kW-hr)[3]								
				CO	NOx	VOC	PM2.5[4]	PM10	SOx[5]	CO_2	N_2O	CH_4
Crew Boat	1,000	746	45%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09
Small Tug Boat	2,000	1,491	31%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09

1. Engine power (kW) estimated by dividing horsepower by a factor of 1.341.
2. Load factor based upon Table 3.4 of *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories*, U.S. EPA, April 2009. Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors (Table 3.8) are for Harbor Vessels.
3. Emission factors were provided in the *Current Methodologies* document, Table 3-8. Category 2 (typically between 1,000 and 3,000 kW) factors were used for both types of boats since the crew boat is almost within that category, and it provides a conservative assumption for pollutants for which the areas are in non-attainment.
4. Assume PM2.5 = PM10
5. SOx emission factor overestimates emissions since it assumes a higher sulfur content fuel than will likely be used.

Emissions from Vessels -- Average Year Over 5 Years

Alternative	Vessel Type	Emission (tons/year, metric tons/year for GHG pollutants)[1,2]								
		CO	NOx	VOC	PM2.5	PM10	SOx	CO_2	N_2O	CH_4
Alt. A or C	Crew Boat	1.08	13.0	0.49	0.71	0.71	1.28	614.8	1.78E-02	0.08
	Small Tug Boat	2.08	25.0	0.95	1.36	1.36	2.46	1,185.8	0.03	0.15
	TOTAL Alt. A or C	**3.16**	**38.0**	**1.44**	**2.07**	**2.07**	**3.74**	**1,800.6**	**0.05**	**0.23**
Alt. B	Crew Boat	0.88	10.6	0.40	0.58	0.58	1.04	503.1	1.46E-02	0.07
	Small Tug Boat	0.90	10.8	0.41	0.59	0.59	1.07	513.6	0.01	0.07
	TOTAL Alt. B	**1.79**	**21.4**	**0.81**	**1.17**	**1.17**	**2.11**	**1,016.7**	**0.03**	**0.13**

1. Emissions quantified using the following equation: Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/kW-hr) x Power Adjustment ÷ 453.59 ÷ 2000. For GHG pollutants CO_2, N_2O, and CH_4, emissions are in metric tons.
2. Power adjustment of 1.1 was assumed for a crew boat to account for auxiliary engines, and 1.5 for a harbor tug, based upon Table 3.5 of the *Current Methodologies* document.

Offshore Activities - Fuel Spill

Spill Volume (gal)[1]	Fuel Type	Density (lb/gal)[2]	Percent Recovered[3] (%)	Amount Not Recovered[3] (gal)	VOC Emissions (lb/yr)	VOC Emissions (tpy)
88	Diesel	7.1	0%	88	624.8	**0.31**

1. Assume a spill of 88 gallons of diesel occurs each year.
2. Liquid fuel density values obtained from Air Emissions Factor Guide to Air Force Stationary Sources, December 2009, Table 14-2.
3. Assume none of the spill could be recovered, and that 100% of the fuel evaporates.

Site Assessment Activities

Onshore Activities - Staff Commuting to Job Site and Material/Equipment Delivery

Vehicle Emission Factors[1]

Personal Vehicle Type	Model Year[2]	Calendar Year[2]	Emission Factors (grams/mile)								
			CO	NOx	VOC	PM2.5[3]	PM10[3]	SOx	CO_2	N_2O	CH_4
Heavy Duty Diesel Vehicles	2009	2015	0.15	1.68	0.18	0.02	0.03	0.01	1,029.9	4.80E-03	5.10E-03
Light Duty Gasoline Vehicles	2009	2015	3.97	0.18	0.24	0.014	0.024	0.01	368.0	3.60E-03	1.73E-02
Light Duty Diesel Trucks	2009	2015	0.35	0.11	0.12	0.02	0.03	0.01	598.6	1.40E-03	9.00E-04

Personal Vehicle Emissions -- Average Year Over 5 Years

Personal Vehicle Type	Total No. of Round Trips/year[4]	Total Miles (per trip)[5]	Emission (tons/year, metric tons/year for GHG pollutants)								
			CO	NOx	VOC	PM2.5	PM10	SOx	CO_2	N_2O	CH_4
Heavy Duty Diesel Vehicles	12	60	2.38E-04	2.67E-03	2.86E-04	3.17E-05	4.76E-05	1.59E-05	1.48	6.91E-06	7.34E-06
Light Duty Gasoline Vehicles	48	60	6.30E-02	2.86E-03	3.81E-03	2.22E-04	3.81E-04	1.59E-04	5.30	5.18E-05	2.49E-04
Light Duty Diesel Trucks	48	60	2.78E-02	8.73E-03	9.52E-03	1.59E-03	2.38E-03	7.94E-04	43.10	1.01E-04	6.48E-05
TOTAL RI/MA EA - 5 towers	-	-	**9.10E-02**	**1.43E-02**	**1.36E-02**	**1.84E-03**	**2.81E-03**	**9.68E-04**	**49.88**	**1.60E-04**	**3.21E-04**
TOTAL Alt. A or C - 3 towers	-	-	**5.46E-02**	**8.55E-03**	**8.17E-03**	**1.10E-03**	**1.69E-03**	**5.81E-04**	**29.93**	**9.57E-05**	**1.93E-04**
TOTAL Alt. B - 2 towers	-	-	**3.64E-02**	**5.70E-03**	**5.45E-03**	**7.37E-04**	**1.12E-03**	**3.87E-04**	**19.95**	**6.38E-05**	**1.29E-04**

1. Emission factors and methodology from Air Emissions Factor Guide to Air Force Mobile Sources, December 2009, Section 4. Emission factors for N_2O and CH_4 obtained from the Federal Greenhouse Gas Accounting and Reporting Guidance Technical Support Document (2010), Table D-1 for Tier 2 gasoline passenger cars, moderate diesel light trucks, and moderate diesel heavy-duty trucks.

2. Assume contractors drive Light Duty Diesel Trucks (Type 3/4), staff drive Light Duty Gasoline Vehicles, and material/equipment deliveries are made using Heavy Duty Diesel Trucks (Type 5), with average of Model Year 2009 in Calendar Year 2015. CY2015 is the latest year provided in the guidance, and provides an approximate median year for the project.
3. Emission factors for PM2.5 an PM10 include fugitive sources of PM from brake and tire.
4. Assume construction, transportation, and erection of all five towers will take place over the course of five years. Assume an average of 25 contractors travel to the site over 240 days total. In addition, assume an average of five staff travel to the site over 240 days total. Lastly, assume two heavy duty trucks travel to the site over 60 days total. **Only one representative year was modeled in these calculations, assuming the work is evenly distributed over the five year span.**
5. Assume each employee drives 60 miles round trip.

Onshore Activities - Heavy Equipment Use -- Average Year Over 5 Years

Construction Equipment	Usage (hrs)	Emission (tons/year, metric tons/year for GHG pollutants)								
		CO	NOx	VOC	PM2.5	PM10	SOx	CO_2	N_2O	CH_4
Cranes	192	7.42E-02	0.18	2.28E-02	2.54E-02	2.54E-02	1.64E-02	10.17	2.98E-04	1.84E-02
Rubber Tired Loaders	192	8.67E-02	0.19	1.56E-02	2.33E-02	2.33E-02	1.55E-02	10.17	2.98E-04	1.84E-02
TOTAL RI/MA EA - 5 towers	**-**	**0.16**	**0.37**	**3.84E-02**	**4.87E-02**	**4.87E-02**	**3.19E-02**	**20.35**	**5.96E-04**	**3.69E-02**
TOTAL Alt. A or C - 3 towers	-	**9.65E-02**	**2.21E-01**	**2.30E-02**	**2.92E-02**	**2.92E-02**	**1.92E-02**	**12.21**	**3.58E-04**	**2.21E-02**
TOTAL Alt. B - 2 towers	-	**6.43E-02**	**1.47E-01**	**1.54E-02**	**1.95E-02**	**1.95E-02**	**1.28E-02**	**8.14**	**2.38E-04**	**1.48E-02**

1. Only cranes and loaders were assumed to be used on shore during assembly of the towers to move and lift the pieces into place.
2. Assume crane and rubber tire loader operate half of the 240 days estimated to complete the construction of the towers, for 8 hours per day (i.e., 960 hours) over the course of five years. **Only one representative year was modeled in these calculations, assuming the work is evenly distributed over the five year span."**
3. Assume PM10 = PM2.5. See EF Construction Equip tab for emission factors.

Site Assessment Activities

Offshore Activities - Transport of Towers to Sites from Ports

Vessel Details for Construction of Towers

Vessel Type	Total No. of Vessel Round Trips/Yr[1]	Avg. Miles Per Round Trip (nautical miles)	Total (nautical miles/yr)	Activity (hrs/yr)[2]
Crane Barge	2	123	247	21
Deck Cargo	2	123	247	21
Small Cargo Barge	2	123	247	21
Crew Boat	21	123	2,593	144
Small Tug Boat	4	123	494	41
Large Tug Boat	8	123	988	82

1. Average to build one meteorological tower, per note in corresponding table in MA/RI EA Appendix D: "Based upon projected vessel usage for the construction of one met tower (Table 3.5), total round trips multiplied by five for a total of five met towers. It was assumed that these trips would be conducted over the course of five years. **Only one representative year was modeled in these calculations, assuming the work is evenly distributed over the five year span."** [5 towers over 5 years, so "one representative year" = amount of activity for one tower.]

2. Assume an average speed of 12 knots for the tug boats/barges and 18 knots for the crew boat to estimate Activity hours based upon Total nautical miles traveled. No time for the vessels spent at idle at the towers was captured in this calculation. http://www.scrutonmarine.com/Crew%20Boats.htm and http://www.chacha.com/question/what-is-the-average-top-speed-of-a-tug-boat

Emission Factors for Vessels

				Emission Factors (g/kW-hr)[4]								
Vessel Type[1]	**Engine Size (hp)**	**Engine Power (kW)[2]**	**Load Factor (%)[3]**	**CO**	**NOx**	**VOC**	**PM2.5[5]**	**PM10**	**SOx[6]**	**CO_2**	**N_2O**	**CH_4**
Crew Boat	1,000	746	45%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09
Small Tug Boat	2,000	1,491	31%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09
Large Tug Boat	4,200	3,132	31%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09

1. The Small and Large Tug Boats are used in conjunction with the Crane Barge, Deck Cargo, and Small Cargo Barge, which do not have an engine. Therefore, only the Crew Boat, Small Tug Boat, and Large Tug Boat have emission factors. Assume construction of towers instead of buoys for a worst case scenario.
2. Engine power (kW) estimated by dividing horsepower by a factor of 1.341.
3. Load factor based upon Table 3.4 of *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories*, U.S. EPA, April 2009. Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors (Table 3.8) are for Harbor Vessels.
4. Emission factors were provided in the *Current Methodologies* document, Table 3-8. Category 2 (typically between 1,000 and 3,000 kW) factors were used for the crew boat, small tug boat, and large tug boat since the crew boat and large tug boat are approximately within that category.
5. Assume PM2.5 = PM10
6. SOx emission factor overestimates emissions since it assumes a higher sulfur content fuel than will likely be used.

Emissions from Vessels -- Average Year Over 5 Years

Vessel Type	Emission (tons/year, metric tons/year for GHG pollutants)[1,2]								
	CO	**NOx**	**VOC**	**PM2.5**	**PM10**	**SOx**	**CO_2**	**N_2O**	**CH_4**
Crew Boat	6.45E-02	0.77	2.93E-02	4.22E-02	4.22E-02	0.08	36.69	1.06E-03	4.79E-03
Small Tug Boat	3.46E-02	0.42	1.57E-02	2.27E-02	2.27E-02	4.09E-02	19.70	5.71E-04	2.57E-03
Large Tug Boat	0.15	1.74	0.07	0.10	0.10	0.17	82.7	2.40E-03	1.08E-02
TOTAL RI/MA EA - 5 towers	**0.24**	**2.93**	**0.11**	**0.16**	**0.16**	**0.29**	**139.1**	**4.03E-03**	**1.81E-02**
TOTAL Alt. A or C - 3 towers	**0.15**	**1.76**	**0.07**	**0.10**	**0.10**	**0.17**	**83.47**	**2.42E-03**	**1.09E-02**
TOTAL Alt. B - 2 towers	**0.10**	**1.17**	**0.04**	**0.06**	**0.06**	**0.12**	**55.65**	**1.61E-03**	**7.26E-03**

1. Emissions quantified using the following equation: Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/kW-hr) x Power Adjustment ÷ 453.59 ÷ 2000. For GHG pollutants CO_2, N_2O, and CH_4, emissions are in metric tons.
2. Power adjustment of 1.1 was assumed for a crew boat to account for auxiliary engines, and 1.5 for a harbor tug, based upon Table 3.5 of the *Current Methodologies* document.

Offshore Activities - Construction of Pilings -- Average Year Over 5 Years

Construction Equipment[1]	Usage[2] (hrs)	Emission (tons/year, metric tons/year for GHG pollutants)								
		CO	NOx	VOC	PM2.5	PM10	SOx	CO_2	N_2O	CH_4
Bore/Drill Rigs	30	4.77E-02	5.71E-02	7.48E-03	7.46E-03	7.46E-03	4.82E-03	1.59	4.66E-05	2.88E-03
Cranes	150	5.79E-02	0.14	1.78E-02	1.99E-02	1.99E-02	1.28E-02	7.95	2.33E-04	1.44E-02
TOTAL RI/MA EA - 5 towers		**0.11**	**0.20**	**2.53E-02**	**2.73E-02**	**2.73E-02**	**1.76E-02**	**9.54**	**2.79E-04**	**1.73E-02**
TOTAL Alt. A or C - 3 towers		**0.06**	**0.12**	**0.02**	**0.02**	**0.02**	**0.01**	**5.72**	**1.68E-04**	**1.04E-02**
TOTAL Alt. B - 2 towers		**0.04**	**0.08**	**0.01**	**0.01**	**0.01**	**0.01**	**3.81**	**1.12E-04**	**6.92E-03**

1. Only bore/drill rigs and cranes were assumed to be used off shore during the construction of the pilings.

2. Assume bore/drill rigs operate for three days, 10 hours per day (i.e., 30 hours) and cranes operate for three weeks total, 10 hours per day (i.e., 150 hours) for each of the five towers. It was assumed that these activities would be conducted over the course of five years. **Only one representative year was modeled in these calculations, assuming the work is evenly distributed over the five year span.**
3. Assume PM10 = PM2.5. See EF Construction Equip tab for emission factors.
4. Assume construction of towers instead of buoys for a worst case scenario.

Offshore Activities - Fuel Spill

Spill Volume (gal)[1]	Fuel Type	Density (lb/gal)[2]	Percent Recovered[3] (%)	Amount Not Recovered[3] (gal)	VOC Emissions (lb/yr)	VOC Emissions (tpy)
88	Diesel	7.1	0%	88	624.8	**0.31**

1. Assume a spill of 88 gallons of diesel occurs each year.
2. Liquid fuel density values obtained from Air Emissions Factor Guide to Air Force Stationary Sources, December 2009, Table 14-2.
3. Assume none of the spill could be recovered, and that 100% of the fuel evaporates.

Site Assessment - Operation and Maintenance

Onshore Activities - Staff Commuting to Job Site

***Personal Vehicle Emission Factors*[1]**

Personal Vehicle Type	Model Year[2]	Calendar Year[2]	Emission Factors (grams/mile)								
			CO	NOx	VOC	PM2.5[3]	PM10[3]	SOx	CO_2	N_2O	CH_4
Light Duty Gasoline Vehicles	2009	2015	3.97	0.18	0.24	0.014	0.024	0.01	368.00	3.60E-03	1.73E-02

Personal Vehicle Emissions -- Average Year Over 5 Years

Personal Vehicle Type	Total No. of Round Trips/Yr[4]	Total Miles (per trip)[5]	Emission (tons/year, metric tons/year for GHG pollutants)								
			CO	NOx	VOC	PM2.5	PM10	SOx	CO_2	N_2O	CH_4
Light Duty Gasoline Vehicles	260	60	**6.83E-02**	**3.10E-03**	**4.13E-03**	**2.41E-04**	**4.13E-04**	**1.72E-04**	**5.74**	**5.62E-05**	**2.70E-04**
TOTAL Alt. A or C - 3 towers			**4.10E-02**	**1.86E-03**	**2.48E-03**	**1.44E-04**	**2.48E-04**	**1.03E-04**	**3.44**	**3.37E-05**	**1.62E-04**
TOTAL Alt. B - 2 towers			**2.73E-02**	**1.24E-03**	**1.65E-03**	**9.63E-05**	**1.65E-04**	**6.88E-05**	**2.30**	**2.25E-05**	**1.08E-04**

1. Emission factors and methodology from Air Emissions Factor Guide to Air Force Mobile Sources, December 2009, Section 4. Emission Factors for N_2O and CH_4 obtained from the Federal Greenhouse Gas Accounting and Reporting Guidance Technical Support Document (2010), Table D-1, for Tier 2 gasoline passenger cars.

2. Assume staff drive Light Duty Gasoline Vehicles, with average of Model Year 2009 in Calendar Year 2015. CY2015 is the latest year provided in the guidance, and provides an approximate median year for the project.
3. Emission factors for PM2.5 an PM10 include fugitive sources of PM from brake and tire.

4. Assume five weekly trips by one person to observe/service each of the five towers, and to refuel/perform maintenance of the assumed three generators. Only one year was modeled but it captures all five towers.
5. Assume 60 miles round trip.

Site Assessment- Operation and Maintenance

Offshore Activities - Routine Maintenance and Evaluation

Maintenance Vessel Details

Task	Vessel Type	Total No. of Vessel Round Trips	Duration of Task (years)	No. of Vessel Round Trips (per year)[2]	Avg. Miles Per Round Trip (nautical miles)	Total (nautical miles/yr)	Activity (hrs/yr)[3]
Routine Maintenance	Crew Boat	260	1	260	123	32,106	1,784

1. Assume five round trips each week using a crew boat to observe/service each of the five towers, including fueling/performing maintenance on the assumed three generators. Only one year was modeled but it captures all five towers.
2. Round trips per year estimated by dividing total round trips per task by the number of years (only one year was modeled) needed to complete task.
3. Assume an average speed of 18 knots to estimate Activity hours based upon Total nautical miles traveled. No time for the vessels spent at idle at the towers was captured in this calculation.

Emission Factors for Vessels

Vessel Type	Engine Size (hp)	Engine Power (kW)[1]	Load Factor (%)[2]	Emission Factors (g/kW-hr)[3]								
				CO	NOx	VOC	PM2.5[4]	PM10	SOx[5]	CO_2	N_2O	CH_4
Crew Boat	1,000	746	45%	1.10	13.20	0.50	0.72	0.72	1.30	690.00	0.02	0.09

1. Engine power (kW) estimated by dividing horsepower by a factor of 1.341.

2. Load factor based upon Table 3.4 of *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories*, U.S. EPA, April 2009. Table 3-1 describes crew boats as Harbor Vessels; therefore, the load factor (Table 3.8) is for Harbor Vessels.

3. Emission factors were provided in the *Current Methodologies* document, Table 3-8. Category 2 (typically between 1,000 and 3,000 kW) factors were used for the crew boat since it is almost within that category, and it provides a conservative assumption for pollutants for which the areas are in non-attainment.

4. Assume PM2.5 = PM10

5. SOx emission factor overestimates emissions since it assumes a higher sulfur content fuel than will likely be used.

Emissions from Vessels -- Average Year Over 5 Years

Vessel Type	Emission (tons/year, metric tons/year for GHG pollutants))[1,2]								
	CO	NOx	VOC	PM2.5	PM10	SOx	CO_2	N_2O	CH_4
Crew Boat	0.80	9.58	0.36	0.52	0.52	0.94	454.3	1.32E-02	5.93E-02
TOTAL RI/MA EA - 5 towers	**0.80**	**9.58**	**0.36**	**0.52**	**0.52**	**0.94**	**454.3**	**1.32E-02**	**5.93E-02**
TOTAL Alt. A or C - 3 towers	**0.48**	**5.75**	**0.22**	**0.31**	**0.31**	**0.57**	**272.6**	**7.90E-03**	**3.56E-02**
TOTAL Alt. B - 2 towers	**0.32**	**3.83**	**0.15**	**0.21**	**0.21**	**0.38**	**181.7**	**5.27E-03**	**2.37E-02**

1. Emissions quantified using the following equation: Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/kW-hr) x Power Adjustment ÷ 453.59 ÷ 2000.
2. Power adjustment of 1.1 was assumed for a crew boat to account for auxiliary engines, and 1.5 for a harbor tug, based upon Table 3.5 of the *Current Methodologies* document.

<u>Offshore Activities – Operation of Prime Generators</u>

Unit Information

Source	Estimated Rated Capacity (hp)	Operating Hours (hours/ year)	Fuel
Three 75 kW diesel-fired generator to serve as primary source of electricity for 3 of the 5 towers	120	8,760	Diesel

Emission Factors [1,2]

Pollutant	Nox	CO	PM	SO_2	VOC	CO_2
Diesel (lb/hp-hr)	0.031	0.0066 8	0.0022	0.00 205	0.0025141	1.08

Potential Criteria Pollutant Emissions [3]

Source	NO_x (tpy)	CO (tpy)	PM/ PM10/ PM2.5 (tpy)	SO_2 (tpy)	VOC (tpy)	CO_2 (metric tpy)
Three 75 kW diesel-fired generator to serve as primary source of electricity for 3 of the 5 towers	16.29	3.51	1.16	1.08	1.32	515.0
TOTAL RI/MA EA – 3 generators	**16.29**	**3.51**	**1.16**	**1.08**	**1.32**	**515.0**
TOTAL Alt. A or C – 3 generators	**16.29**	**3.51**	**1.16**	**1.08**	**1.32**	**515.0**
TOTAL Alt. B – 2 generators	**10.86**	**2.34**	**0.77**	**0.72**	**0.88**	**343.3**

1. Emission factors were obtained from AP-42, Section 3.3.
2. Conservatively assumed PM = PM10 = PM 2.5.
3. Emissions were calculated for one year, per generator.

Offshore Activities – Fuel Spill

Spill Volume (gal)[1]	Fuel Type	Density (lb/gal)[2]	Percent Recovered[3] (%)	Amount Not Recovered[3] (gal)	VOC Emissions (lb/yr)	VOC Emissions (tpy)
88	Diesel	7.1	0%	88	624.8	**0.31**

1. Assume a spill of 88 gallons of diesel occurs each year.
2. Liquid fuel density values obtained from Air Emissions Factor Guide to Air Force Stationary Sources, December 2009, Table 14-2.
3. Assume none of the spill could be recovered, and that 100% of the fuel evaporates.

Onshore Activities - Contractors Commuting to Job Site for Decommission

***Vehicle Emission Factors*[1]**

Personal Vehicle Type	Model Year[2]	Calendar Year[2]	Emission Factors (grams/mile)								
			CO	NOx	VOC	PM2.5[3]	PM10[3]	SOx	CO_2	N_2O	CH_4
Heavy Duty Diesel Vehicles	2009	2015	0.15	1.68	0.18	0.02	0.03	0.01	1,029.90	4.80E-03	5.10E-03
Light Duty Gasoline Vehicles	2009	2015	3.97	0.18	0.24	0.014	0.024	0.01	368.00	3.60E-03	1.73E-02
Light Duty Diesel Trucks	2009	2015	0.35	0.11	0.12	0.02	0.03	0.01	598.60	1.40E-03	9.00E-04

Personal Vehicle Emissions -- Average Year Over 5 Years

Personal Vehicle Type	Total No. of Round Trips[4]	Total Miles (per trip)[5]	Emission (tons/year, metric tons/year for GHG pollutants)								
			CO	NOx	VOC	PM2.5	PM10	SOx	CO_2	N_2O	CH_4
Heavy Duty Diesel Vehicles	12	60	2.38 E-04	2.67 E-03	2.86 E-04	3.17E-05	4.76E-05	1.59 E-05	1.48	6.91E-06	7.34E-06
Light Duty Gasoline Vehicles	48	60	6.30 E-02	2.86 E-03	3.81 E-03	2.22E-04	3.81E-04	1.59 E-04	5.30	5.18E-05	2.49E-04
Light Duty Diesel Trucks	48	60	2.78 E-02	8.73 E-03	9.52 E-03	1.59E-03	2.38E-03	7.94 E-04	43.10	1.01E-04	6.48E-05
	TOTAL RI/MA EA - 5 towers	-	**9.10 E-02**	**1.43 E-02**	**1.36 E-02**	**1.84E-03**	**2.81E-03**	**9.68 E-04**	**49.88**	**1.60E-04**	**3.21E-04**
	TOTAL Alt. A or C - 3 towers	-	**5.46 E-02**	**8.55 E-03**	**8.17 E-03**	**1.10E-03**	**1.69E-03**	**5.81 E-04**	**2.99E+01**	**9.57E-05**	**1.93E-04**
	TOTAL Alt. B - 2 towers	-	**3.64 E-02**	**5.70 E-03**	**5.45 E-03**	**7.37E-04**	**1.12E-03**	**3.87 E-04**	**2.00E+01**	**6.38E-05**	**1.29E-04**

1. Emission factors and methodology from Air Emissions Factor Guide to Air Force Mobile Sources, December 2009, Section 4. Emission factors for N_2O and CH_4 obtained from the Federal Greenhouse Gas Accounting and Reporting Guidance Technical Support Document (2010), Table D-1 for Tier 2 gasoline passenger cars, moderate diesel light trucks, and moderate diesel heavy-duty trucks.

2. Assume contractors drive Light Duty Diesel Trucks (Type 3/4), staff drive Light Duty Gasoline Vehicles, and material/ equipment deliveries are made using Heavy Duty Diesel Trucks (Type 5), with average of Model Year 2009 in Calendar Year 2015. CY2015 is the latest year provided in the guidance, and provides an approximate median year for the project.

3. Emission factors for PM2.5 an PM10 include fugitive sources of PM from brake and tire.
4. Assume decommissioning of all five towers will take place over the course of five years. Assume an average of 25 contractors travel to the site over 240 days total. In addition, assume an average of five staff travel to the site over 240 days total. Lastly, assume two heavy duty trucks travel to the site over 60 days total. **Only one representative year was modeled in these calculations, assuming the work is evenly distributed over the five year span.**
5. Assume each employee drives 60 miles round trip.

Site Assessment - Decommission

Offshore Activities - Tower Decommissioning

Vessel Details for Decommissioning of Towers

Vessel Type	Total No. of Vessel Round Trips	Avg. Miles Per Round Trip (nautical miles)	Total (nautical miles/yr)	Activity (hrs/yr)[1]
Crane Barge	2	180	360	30
Deck Cargo	2	180	360	30
Small Cargo Barge	2	180	360	30
Crew Boat	21	180	3,780	210
Small Tug Boat	4	180	720	60
Large Tug Boat	8	180	1,440	120

1. Average to decommission one meteorological tower, per note in corresponding table in MA/RI EA Appendix D: "Round trips for the decommissioning of five towers assumed to be equivalent to the construction of five towers, using Table 3-5 round trips per tower. It was assumed that these trips would be conducted over the course of five years. **Only one representative year was modeled in these calculations, assuming the work is evenly distributed over the five year span."**

2. Assume an average speed of 12 knots for the tug boats/barges and 18 knots for the crew boat to estimate Activity hours based upon Total nautical miles traveled. No time for the vessels spent at idle at the towers was captured in this calculation. http://www.scrutonmarine.com/Crew%20Boats.htm and http://www.chacha.com/question/what-is-the-average-top-speed-of-a-tug-boat

Emission Factors for Vessels

Vessel Type[1]	Engine Size (hp)	Engine Power (kW)[2]	Load Factor (%)[3]	Emission Factors (g/kW-hr)[4]								
				CO	NOx	VOC	PM2.5[5]	PM10	SOx[6]	CO_2	N_2O	CH_4
Crew Boat	1,000	746	45%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09
Small Tug Boat	2,000	1,491	31%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09
Large Tug Boat	4,200	3,132	31%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09

1. The Small and Large Tug Boats are used in conjunction with the Crane Barge, Deck Cargo, and Small Cargo Barge, which do not have an engine. Therefore, only the Crew Boat, Small Tug Boat, and Large Tug Boat have emission factors. Assume decommissioning of towers instead of buoys for a worst case scenario.
2. Engine power (kW) estimated by dividing horsepower by a factor of 1.341.
3. Load factor based upon Table 3.4 of *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories*, U.S. EPA, April 2009. Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors (Table 3.8) are for Harbor Vessels.
4. Emission factors were provided in the *Current Methodologies* document, Table 3-8. Category 2 (typically between 1,000 and 3,000 kW) factors were used for the crew boat, small tug boat, and large tug boat since the crew boat and large tug boat are approximately within that category.
5. Assume PM2.5 = PM10
6. SOx emission factor overestimates emissions since it assumes a higher sulfur content fuel than will likely be used.

Emissions from Vessels -- Average Year Over 5 Years

Vessel Type	Emission (tons/year, metric tons/year for GHG pollutants)[1,2]								
	CO	**NOx**	**VOC**	**PM2.5**	**PM10**	**SOx**	**CO_2**	**N_2O**	**CH_4**
Crew Boat	9.40E-02	1.13	4.27E-02	6.15E-02	6.15E-02	0.11	53.49	1.55E-03	6.98E-03
Small Tug Boat	5.05E-02	0.61	2.29E-02	3.30E-02	3.30E-02	5.96E-02	28.71	8.32E-04	3.74E-03
Large Tug Boat	0.21	2.54	0.10	0.14	0.14	0.25	120.6	3.50E-03	1.57E-02
TOTAL RI/MA EA - 5 towers	**0.36**	**4.28**	**0.16**	**0.23**	**0.23**	**0.42**	**202.8**	**5.88E-03**	**2.65E-02**
TOTAL Alt. A or C - 3 towers	**0.21**	**2.57**	**0.10**	**0.14**	**0.14**	**0.25**	**121.7**	**3.53E-03**	**1.59E-02**
TOTAL Alt. B - 2 towers	**0.14**	**1.71**	**0.06**	**0.09**	**0.09**	**0.17**	**81.1**	**2.35E-03**	**1.06E-02**

1. Emissions quantified using the following equation: Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/kW-hr) x Power Adjustment ÷ 453.59 ÷ 2000. For GHG pollutants CO_2, N_2O, and CH_4, emissions are in metric tons.
2. Power adjustment of 1.1 was assumed for a crew boat to account for auxiliary engines, and 1.5 for a harbor tug, based upon Table 3.5 of the *Current Methodologies* document.

Offshore Activities - Deconstruction of Pilings

Construction Equipment	Usage (hrs)	Emission (tons/year, metric tons/year for GHG pollutants)								
		CO	NOx	VOC	PM2.5	PM10	SOx	CO_2	N_2O	CH_4
Concrete/ Indust. Saw	200	8.29E-02	0.10	1.30E-02	1.30E-02	1.30E-02	8.38E-03	10.60	3.11E-04	1.92E-02
Cranes	200	7.72E-02	0.19	2.38E-02	2.65E-02	2.65E-02	1.71E-02	10.60	3.11E-04	1.92E-02
	TOTAL RI/MA EA - 5 towers	**1.60E-01**	**0.29**	**3.68E-02**	**3.95E-02**	**3.95E-02**	**2.55E-02**	**21.19**	**6.21E-04**	**3.84E-02**
	TOTAL Alt. A or C - 3 towers	**9.61E-02**	**0.17**	**2.21E-02**	**2.37E-02**	**2.37E-02**	**1.53E-02**	**12.7**	**3.73E-04**	**2.31E-02**
	TOTAL Alt. B - 2 towers	**6.41E-02**	**0.12**	**1.47E-02**	**1.58E-02**	**1.58E-02**	**1.02E-02**	**8.5**	**2.48E-04**	**1.54E-02**

1. Only concrete/industrial saws and cranes were assumed to be used off shore during the deconstruction of the pilings.
2. Assume that the equipment operates for four weeks, 10 hours per day (i.e., 200 hours) for each of the five towers. It was assumed that these activities would be conducted over the course of five years. **Only one representative year was modeled in these calculations, assuming the work is evenly distributed over the five year span.**
3. Assume PM10 = PM2.5. See EF Construction Equip tab for emission factors.
4. Assume decommissioning of towers instead of buoys for a worst case scenario.

Offshore Activities - Fuel Spill

Spill Volume (gal)[1]	Fuel Type	Density (lb/gal)[2]	Percent Recovered[3] (%)	Amount Not Recovered[3] (gal)	VOC Emissions (lb/yr)	VOC Emissions (tpy)
88	Diesel	7.1	0%	88	624.8	**0.31**

1. Assume a spill of 88 gallons of diesel occurs each year.
2. Liquid fuel density values obtained from Air Emissions Factor Guide to Air Force Stationary Sources, December 2009, Table 14-2.
3. Assume none of the spill could be recovered, and that 100% of the fuel evaporates.

Construction Equipment Air Quality Emission Factors

Diesel Equipment	Average Rated HP[1]	Consumption (mpg)[2]	Loading Factors[3]	Emission Factors (grams/HP-hr)[4]						Emission Factors (lbs/hr)[5]						Emission Factors (grams/mile)[6]		
				CO	NOx	VOC	PM	Aldehydes	SOx	CO	NOx	VOC	PM	Aldehydes	SOx	CO_2	N_2O	CH_4
Bore/Drill Rigs	209	6.17	75%	9.20	11.01	1.443	1.44	0.20	0.93	3.18	3.80	0.50	0.50	0.07	0.32	116.81	3.42 E-03	0.21
Concrete/ Indust. Saw	56	6.17	73%	9.20	11.01	1.443	1.44	0.20	0.93	0.83	0.99	0.13	0.13	0.02	0.08	116.81	3.42 E-03	0.21
Cranes	194	6.17	43%	4.20	10.30	1.293	1.44	0.20	0.93	0.77	1.89	0.24	0.26	0.04	0.17	116.81	3.42 E-03	0.21
Rubber Tired Loaders	158	6.17	54%	4.80	10.30	0.863	1.29	0.20	0.86	0.90	1.94	0.16	0.24	0.04	0.16	116.81	3.42 E-03	0.21

Note: The above information was selected from the following tables provided in the *Nonroad Engine and Vehicle Emission Study--Report*, US EPA Doc 21A-2001, 1991.

1. Table 2-04 for Inventory A (Inventory A generally gives higher results and is, therefore, more conservative than Inventory B)
2. Vehicle fuel consumption from USAF IERA Air Emissions Inventory Guidance Document For Mobile Sources at Air Force Installations, May 1999, Revised January 2002, Section 4.
3. Table 2-05 for Inventory A
4. Table 2-07a for Diesel Equipment
5. **Emission Factors** (lbs/hr) = **Average Rated HP** X **Loading Factors** X **Emission Factors** (grams/HP-hr) X **Conversion Factor** (grams to lbs)
6. GHG Emission factors obtained from Environment Canada National Inventory Report Greenhouse Gas Sources Section A13.1.4 Moderately Controlled Diesel Mobile Combustion; factors were changed from grams/liter to grams/mile using conversion factor 1 liter=0.264 gallons and average fuel consumption.

APPENDIX E
AGENCY CONSULTATION AND COORDINATION

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United States Department of the Interior

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March 17, 2014

Michelle V. Morin
Bureau of Ocean Energy Management
Office of Renewable Energy Programs
Environment Branch for Renewable Energy
381 Elden Street, HM 1328
Herndon, VA 20170-4817

RE: Biological Assessment for Commercial Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf, Offshore North Carolina, South Carolina, and Georgia

Dear Ms. Morin:

This is in response to the Bureau of Ocean Energy Management's (BOEM) February 12, 2014 letter and Biological Assessment (BA), requesting consultation on the effects from proposed activities in areas on the Atlantic Outer Continental Shelf (OCS), Offshore North Carolina, South Carolina, and Georgia. The U.S. Fish and Wildlife Service (Service) has reviewed the BA and has comments for BOEM's consideration. Our review and comments are provided pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543). Service programs involved in preparation of this letter include Ecological Services offices in Raleigh, NC, Charleston, SC, and Athens, GA, along with the offices of Migratory Birds, and Refuges.

Federally Protected Species

The Service has reviewed available information on federally-threatened or endangered species known to occur offshore of North Carolina. Listed species under our jurisdiction that occur in the area include the West Indian manatee (*Trichechus manatus*), Bermuda petrel (*Pterodroma cahow*), piping plover (*Charadrius melodus*), roseate tern (*Sterna dougallii*), Kirtland's warbler (*Setophaga kirtlandii*). Also, on June 21, 2012, The Service issued publication of the 90-day Finding on a Petition to List the Black-Capped Petrel (*Pterodroma hasitata*) as Endangered or Threatened (77 FR 120: 37367). On September 30, 2013, the red knot (*Calidris canuta rufa*) was proposed to be listed as threatened under the ESA.

Whales, shortnose sturgeon (*Acipenser brevirostrum*), Atlantic sturgeon (*Acipenser oxyrinchus*), and sea turtles in the water are under the jurisdiction of NOAA Fisheries' Protected Species Division. Please contact them concerning these species.

BOEM has made a determination of May Affect, Not Likely to Adversely Affect the Bermuda petrel, black-capped petrel, Kirland's warbler, roseate tern, piping plover, red knot. For the West Indian manatee and piping plover critical habitat, BOEM has determined that the project will have No Effect.

Service Comments

As we stated in our July 8, 2013 letter concerning the list of species to be considered in the BA, the Service is concerned mainly with the potential effects of lighting and collisions with towers on listed bird species.

In Section 4.2.1, the February 2014 BA discusses the potential effects of construction, lighting, collision, micro wind turbines, tower decommissioning, and discharge of waste materials and accidental fuel leaks. Under lighting, the BA states that red flashing lights would be used at all of the meteorological towers to reduce the risk of bird collisions. In addition, any additional lights on towers and support vessels will be used only when necessary and will be hooded downwards and directed when possible to reduce upward illumination and illumination of adjacent waters. We recommend that these lighting commitments be included in Section 6 of the BA.

The discussion about collisions states that by placing 16 meteorological towers over an area of approximately 960,288 hectares, it is unlikely that birds will routinely encounter these structures. The Service agrees with this assessment of risk of general collisions with met towers.

Summary

With the commitments made in the BA, the Service concurs with BOEM's determination that commercial wind lease issuance and site assessment activities on the Atlantic OCS may affect, but will not likely adversely affect the Bermuda petrel, black-capped petrel, Kirland's warbler, roseate tern, piping plover, and red knot. For the West Indian manatee and for piping plover critical habitat, the Service concurs with BOEM's determination of no effect.

Thank you for the opportunity to review the BA. If you have any questions, please contact Kathy Matthews at (919) 856-4520, x. 27 or kathy_matthews@fws.gov.

Sincerely,

Pete Benjamin
Field Supervisor
Raleigh Ecological Services Office

cc:
Fritz Rohde, NMFS, Pivers Island
Pace Wilbur, NMFS, Charleston, SC

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
WASHINGTON, DC 20240-0001

OCT 14 2014

Ms. Donna S. Wieting
NOAA Fisheries Service
Office of Protected Resources
1315 East-West Highway
Silver Spring, Maryland 20910

Dear Ms. Wieting:

On July 19, 2013, your office issued a Biological Opinion pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, to the Bureau of Ocean Energy Management (BOEM) for geological and geophysical surveys in BOEM's Mid-Atlantic and South Atlantic Planning Areas. This opinion covered activities under three of BOEM's Programs, including activities authorized under the Offshore Renewable Energy Program.

This letter serves to communicate to you BOEM's intentions regarding issuing leases and approving site assessment plans offshore North Carolina pursuant to the July 2013 consultation. BOEM is preparing an environmental assessment considering: (1) issuing leases; (2) associated site characterization surveys that lessees may undertake on those; and (3) the subsequent approval of site assessment activities on the leaseholds (e.g., installation and operation of meteorological towers and buoys).

Since the site characterization surveys (e.g., geophysical and geotechnical surveys), being the only reasonably foreseeable activities resulting from lease issuance, and the deployment of meteorological and oceanographic buoys fall within the proposed action for which we previously consulted, BOEM has determined that no additional consultation is needed prior to issuing leases and approving site assessment plans for buoys. Any renewable energy leases that are issued offshore North Carolina will include the reasonable and prudent measures for non-airgun surveys and vessel strike avoidance measures that were included in the incidental take statement in the July 2013 Opinion. Furthermore, when BOEM receives survey plans from lessees offshore North Carolina, we will review them to ensure that they are wholly consistent with the programmatic consultation. For site assessment activities not included in the July 2013 Opinion (e.g., meteorological tower construction), BOEM will consult with the NMFS Southeast Regional Office if a site assessment plan describing such activity is submitted to the Bureau.

If you have any questions or require additional information, please contact Dr. Desray Reeb at (703) 787-1768 or Desray.Reeb@boem.gov.

Sincerely,

Michelle V. Morin

Michelle V. Morin
Chief, Environment Branch for
Renewable Energy

cc:
NMFS: Kellie Foster-Taylor

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
WASHINGTON, DC 20240-0001

FEB 13 2014

Mr. David Bernhart
Assistant Regional Administrator for Protected Resources
NOAA Fisheries Service
Southeast Regional Office
263 13th Avenue South
Saint Petersburg, Florida 33701

Dear Mr. Bernhart:

Pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, the Bureau of Ocean Energy Management (BOEM) requests formal consultation with the National Marine Fisheries Service (NMFS) on the effects on ESA-listed species from proposed activities in areas on the Atlantic Outer Continental Shelf (OCS) offshore North Carolina, South Carolina, and Georgia. Activities being considered include: 1) issuing renewable energy leases; 2) associated site characterization surveys (e.g., geophysical, geotechnical, archaeological and biological surveys); and 3) wind resource site assessment activities (e.g., installation and operation of meteorological towers and/or buoys).

BOEM is the lead action agency for these proposed activities and has previously requested and received technical assistance from NMFS staff (SER-2013-11606) in preparing the enclosed biological assessment (BA). BOEM will include the US Army Corps of Engineers (USACE) as a joint action agency for these activities as some aspects of the proposed activities may be permitted by USACE (see below for contact information).

Specific geographic information regarding the proposed action areas is included in the enclosed BA. However, digital spatial files of all of BOEM's renewable energy planning areas are also available at: http://www.boem.gov/Renewable-Energy-Program-Mapping-and-Data/.

The enclosed BA concludes that the impacts of the proposed activities, in consideration of standard operating conditions, are expected to result in temporary adverse impacts to some ESA-listed marine mammals and sea turtles, due to pile driving noise exposure at a level equivalent to Level B harassment under existing thresholds established under the Marine Mammal Protection Act. BOEM concludes that the proposed activities are not likely to adversely affect ESA-listed fish. BOEM has also determined that no existing critical habitat would be impacted by the proposed activities. BOEM has concluded that the proposed actions will not adversely modify the proposed loggerhead sea turtle critical habitat but that a conference with NMFS may be necessary to further discuss BOEM's interpretation of impacts to the proposed critical habitat. The ESA consultation with the U.S. Fish and Wildlife Service (USFWS) remains informal as BOEM concludes that the proposed actions are not likely to adversely affect ESA-listed species under their jurisdiction.

Per statutory time frames, BOEM requests the conclusion of this consultation within 90 days from receipt of this letter and enclosed BA. If you have any questions or require additional information, please contact Mr. Brian Hooker at (703) 787-1634 or Brian.Hooker@boem.gov.

Correspondence should be sent to the following address:

Bureau of Ocean Energy Management
Office of Renewable Energy Programs
Environment Branch for Renewable Energy
381 Elden Street, HM 1328
Herndon, Virginia 20170-4817

Sincerely,

Michelle V. Morin

Michelle V. Morin
Chief, Environment Branch for Renewable Energy

Enclosure
South Atlantic Biological Assessment

electronic cc:
USFWS: Pete Benjamin (pete_benjamin@fws.gov)
USACE: Jennifer Frye (Jennifer.S.Frye@usace.army.mil), and Corps Districts: South Atlantic Savannah, South Atlantic Wilmington and South Atlantic Charleston

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

Robert LaBelle
Science Advisor, BOEM
Office of the Director, HM3127
381 Elden Street
Herndon, VA 20170-48170

MAY 24 2013

Dear Mr. LaBelle:

Enclosed is the National Marine Fisheries Service's (NMFS') Biological Opinion, issued under the authority of section 7(a)(2) of the Endangered Species Act, on the effects of the Bureau of Ocean Energy Management's (BOEM's) and the Bureau of Safety and Environmental Enforcement's (BSEE's) proposed geological and geophysical (G&G) activities on threatened and endangered species and designated critical habitat. The proposed activities are in support of BOEM's and BSEE's oil and gas, renewable energy, and marine minerals programs in the Mid- and South Atlantic Planning Areas occurring from 2013 through 2020.

The opinion describes the potential for incidental effects from G&G activities on endangered blue, fin, sei, humpback, North Atlantic right and sperm whales as well as green, hawksbill, Kemp's ridley, leatherback and Northwest Atlantic loggerhead sea turtles, and certain fish species. After considering the status of threatened and endangered species, the environmental baseline, and the direct, indirect and cumulative effects of the action on threatened and endangered species, we conclude that these proposed activities are not likely to jeopardize the continued existence of threatened or endangered species nor destroy or adversely modify designated critical habitat under NMFS' jurisdiction.

Section 7(b)(4) of the ESA requires that when a proposed agency action is found to be consistent with section 7(a)(2) of the ESA and the proposed action may incidentally take individuals of listed species, NMFS will issue an incidental take statement (ITS) which provides an exemption from the taking prohibitions contained in Section 9 of the ESA. The incidental take statement attached to this biological opinion includes several nondiscretionary reasonable and prudent measures to minimize effects to listed species from G&G activities. These measures are binding conditions and must be followed for the exemption provided by the ITS to apply. The ITS that is attached to this biological opinion becomes effective immediately for threatened and endangered sea turtles and remains in effect through 2020 if BOEM and BSEE implement the reasonable and prudent measures and terms and conditions contained in the ITS.

Section 7(b)(4)(C) of the ESA provides that if an endangered or threatened marine mammal is involved, the taking must first be authorized by Section 101(a)(5) of the Marine Mammal Protection Act of 1972, as amended (MMPA), before take can be exempted through an ITS. Accordingly, this opinion does not exempt the incidental take of blue, fin, sei, humpback, North Atlantic right or sperm whales. In order to be exempt from the Section 9 take prohibitions, an

MMPA incidental take authorization is required. NMFS will reinitiate this consultation as appropriate on NMFS Permits and Conservation Division's proposed issuance of any MMPA incidental take authorization and may exempt the take of listed marine mammals at that time.

This concludes formal consultation for BOEM's and BSEE's proposed G&G activities. Consultation must be reinitiated if: (1) the amount or extent of taking specified in the Incidental Take Statement is exceeded; (2) new information reveals effects of these actions that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) any of the identified actions are subsequently modified in a manner that causes an effect to the listed species that was not considered in the Biological Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified actions.

I look forward to continued cooperation with BOEM and BSEE during future section 7 consultations.

Sincerely,

Donna S Wieting

Donna S. Wieting
Director,
Office of Protected Resources

Enclosure
cc: Charles Barbee

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1875 Century Boulevard
Atlanta, Georgia 30345

In Reply Refer To:
FWS/R4/ES

AUG 07 2012

Mr. Alan D. Thornhill
Chief Environmental Officer
Bureau of Ocean Energy Management
1849 C Street, NW
Washington, D.C. 20240-0001

Dear Mr. Thornhill:

On June 19, 2012, we received your consultation request for proposed geological and geophysical (G&G) exploration activities in the Bureau of Ocean Energy Management (BOEM) Mid and South Atlantic Planning Areas associated with oil and gas, renewable energy, and the marine minerals programs. Your consultation request included a draft programmatic Environmental Impact Statement and a Biological Assessment (BA) that addressed the effects of your proposed action and supported your effects determinations for listed species and critical habitats (as listed in Table A-8 of your BA). In your consultation request, BOEM concluded in the BA that the proposed G&G exploration activities would have no effect or would not be likely to adversely affect all of the federally-listed species and potentially affected critical habitats under the U.S. Fish and Wildlife Service's (Service) jurisdiction.

The Service's response represents both the Services' Southeast and Northeast Regions, and is the result of review by all Service field offices within the area affected by your proposed action. We concur that the proposed G&G exploration activities would have no effect on, or would not be likely to adversely affect the federally-listed species or designated critical habitats as determined in your consultation request of June 11, 2012. We would point out that this response addresses only those federally-listed species, critical habitats, and portions of shared jurisdictions administered by the Service. We defer to the National Marine Fisheries Service for species, critical habitats, and portions of shared jurisdictions administered by their bureau.

Please be reminded that it may be necessary for you to contact the Service for reconsideration of the effects of this proposed action if:

- New information reveals effects of the action that may affect listed species or critical habitats in a manner or to an extent not considered in your current determination;
- the action is later modified in a manner that causes an effect to the listed species or critical habitat not considered in this informal consultation; or
- a new species is listed or critical habitat designated that may be affected by this action.

If you have any questions, please contact Ken Graham, Ecological Service, Southeast Region, at (404) 679-7358.

Sincerely yours,

Leopoldo Miranda
Assistant Regional Director
Ecological Services

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF OCEAN ENERGY MANAGEMENT; NORTH CAROLINA STATE HISTORIC PRESERVATION OFFICER; AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
REGARDING
REVIEW OF OUTER CONTINENTAL SHELF RENEWABLE ENERGY ACTIVITIES UNDER SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

WHEREAS, the Outer Continental Shelf Lands Act grants the Secretary of the Interior the authority to issue leases, easements, or rights-of-way on the Outer Continental Shelf (OCS) for the purpose of renewable energy development, including wind energy development (43 U.S.C. §1337(p)(1)(C)), and to promulgate regulations to carry out this authority (43 U.S.C. §1337(p)(8)); and,

WHEREAS, the Secretary delegated this authority to the former Minerals Management Service, now the Bureau of Ocean Energy Management (BOEM), and promulgated final regulations implementing this authority at 30 CFR §585; and,

WHEREAS, under the renewable energy regulations, the issuance of leases and subsequent approval of wind energy development on the OCS is a staged decision-making process that occurs in distinct phases; and,

WHEREAS, BOEM may issue commercial leases, limited leases, research leases, Interim Policy leases, Right-of-way (ROW) grants, or Right-of-use and easement (RUE) grants on the OCS; and,

WHEREAS, *Outer Continental Shelf* (OCS) means all submerged lands lying seaward and outside of the area of lands beneath navigable waters, as defined in Section 2 of the Submerged Lands Act (43 U.S.C. §1301), whose subsoil and seabed appertain to the United States and are subject to its jurisdiction and control (*see* 30 CFR §585.112); and,

WHEREAS, *Commercial lease* means a lease, issued under the renewable energy regulations, that specifies the terms and conditions under which a person can conduct commercial activities (*see* 30 CFR §585.112); and,

WHEREAS, *Commercial activities* mean, for renewable energy leases and grants, all activities associated with the generation, storage, or transmission of electricity or other energy products from a renewable energy project on the OCS, and for which such electricity or other energy product is intended for distribution, sale, or other commercial use, except for electricity or other energy products distributed or sold pursuant to technology-testing activities on a limited lease. This term also includes activities associated with all stages of development, including initial site characterization and assessment, facility construction, and project decommissioning (*see* 30 CFR §585.112); and, WHEREAS, *Limited lease* means a lease, issued under the renewable energy regulations, that specifies the terms and conditions under which a person may conduct activities on the OCS that support the production of energy, but do not result in the production of electricity or other energy products for sale, distribution, or other commercial use exceeding a limit specified in the lease (*see* 30 CFR §585.112); and,

WHEREAS, *Research lease* means an OCS lease, ROW grant, and/or RUE grant, issued under the renewable energy regulations at 30 CFR § 585.238, to a Federal agency or a state for renewable energy research activities that support the future production, transportation, or transmission of renewable energy (*see* 30 CFR § 585.112); and,

WHEREAS, *Interim Policy lease* means a lease issued under the Interim Policy announced in November 2007, which allows for limited leasing for resource data collection and technology testing activities. The Interim Policy leases have a five-year term and provide no subsequent commercial rights (*see* 72 FR 62673); and,

WHEREAS, *ROW grant* means an authorization, issued under the renewable energy regulations to use a portion of the OCS for the construction and use of a cable or pipeline for the purpose of gathering, transmitting, distributing, or otherwise transporting electricity or other energy product generated or produced from renewable energy. A ROW grant authorizes the holder to install on the OCS cables, pipelines, and associated facilities that involve the transportation or transmission of electricity or other energy products from renewable energy projects (*see* 30 CFR § 585.112); and,

WHEREAS, *RUE grant* means an easement, issued under the renewable energy regulations, that authorizes use of a designated portion of the OCS to support activities on a lease or other use authorization for renewable energy activities. A RUE grant authorizes the holder to construct and maintain facilities or other installations on the OCS that support the production, transportation, or transmission of electricity or other energy products from any renewable energy resource (*see* 30 CFR § 585.112); and,

WHEREAS, *qualified marine archaeologist* means a person who meets the Secretary of the Interior's Professional Qualification Standards for Archaeology (48 FR 44738-44739), and has experience analyzing marine geophysical data; and,

WHEREAS, *qualified architectural historian* means a person who meets the Secretary of the Interior's Professional Qualification Standards for Architectural History (48 FR 44738-44739); and,

WHEREAS, any human skeletal remains discovered in state waters or on non-federal state lands during the course of archaeological investigations will be treated in accordance with the stipulations of North Carolina General Statute (G.S.) 70, Article 3; and,

WHEREAS, a permit from the North Carolina Office of State Archaeology is required prior to the initiation of any archaeological investigation within state waters (*see* North Carolina G.S. 121-23 through 121-25; 07 North Carolina Administrative Code (NCAC) 04.1002 et seq.) or on state-owned land (*see* G.S. 70-10 through 70-20; 07 NCAC 04R.0701 et seq.); and, WHEREAS, under BOEM's renewable energy regulations, BOEM may review and approve, approve with modifications, or disapprove Site Assessment Plans (SAPs), Construction and Operations Plans (COPs), and General Activities Plans (GAPs), collectively "Plans" (*see* 30 CFR §585.613(e), 585.628(f), and 585.648(e)); and,

WHEREAS, Commercial leases, Limited leases, ROW grants, and RUE grants do not authorize the lessee or grantee to construct any facilities; rather, the lease or grant authorizes the lessee or grantee the right to use the leased area to develop Plans, which must be submitted to and approved by BOEM before the lessee or grantee implements its Plans (*see* 30 CFR §585.600 and 585.601); and,

WHEREAS, under the Interim Policy, BOEM may review and object to project Plans; and,

WHEREAS, BOEM determined that issuing leases and grants and approving Plans constitute undertakings subject to Section 106 of the National Historic Preservation Act (NHPA; 16 U.S.C. §470(f)), and its implementing regulations (36 CFR §800); and,

WHEREAS, the issuance of a commercial lease, limited lease, ROW grant, or RUE grant has the potential to affect historic properties insofar as it may lead to the lessee or grantee conducting geotechnical testing; and,

WHEREAS, *historic property* means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (*see* 36 CFR §800.16(l)(1)); and,

WHEREAS, the issuance of a research lease or Interim Policy lease or approval of a Plan has the potential to affect historic properties insofar as it may lead to the lessee conducting geotechnical testing; constructing and operating site assessment facilities and renewable energy structures; and, placing and operating transmission cables, pipelines, and/or associated facilities that involve the transportation or transmission of electricity or other energy products from renewable energy projects; and,

WHEREAS, BOEM may issue multiple renewable energy leases and grants and approve multiple Plans associated with each lease or grant issued on the OCS; and,

WHEREAS, BOEM determined that the implementation of the Offshore Renewable Energy Program is complex, as the decisions on these undertakings are phased, pursuant to 36 CFR §800.14(b); and,

WHEREAS, 36 CFR §800.4(b)(2) provides for deferral of final identification and evaluation of historic properties when provided for in a Programmatic Agreement (Agreement) executed pursuant to 36 CFR §800.14(b); and,

WHEREAS, BOEM determined that the identification and evaluation of historic properties shall be conducted through a phased approach, pursuant to 36 CFR §800.4(b)(2), where the final identification of historic properties may occur after the issuance of a lease or grant and before the approval of a Plan because lessees conduct site characterization surveys in preparation for Plan submittal (*see* 30 CFR 585); and,

WHEREAS, the deferral of final identification and evaluation of historic properties could result in the discovery of previously unknown historic properties that could significantly impact project planning, siting, and timelines; and,

WHEREAS, 36 CFR §800.14(b)(3) provides for developing programmatic agreements for complex or multiple undertakings and §800.14(b)(1) provides for using such agreements when effects on historic properties cannot be fully determined prior to approval of an undertaking (*see* §800.14(b)(1)(ii)), and for other circumstances warranting a departure from the normal Section 106 process (*see* §800.14(b)(1)(v)); and,

WHEREAS, BOEM, the North Carolina State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (ACHP) are signatories to this Agreement, pursuant to 36 CFR §800.14; and,

WHEREAS, the Section 106 consultations described in this Agreement will be used to establish a process to identify historic properties located within the undertakings' Area(s) of Potential Effects (APE), to assess the potential effects, and to avoid, reduce, or resolve any adverse effects; and,

WHEREAS, BOEM shall make a reasonable and good faith effort to identify any Indian tribes that might attach religious and cultural significance to historic properties in the APE and invite them to be consulting parties; and,

WHEREAS, BOEM involves the public and identifies other consulting parties through notifications, requests for comments, existing renewable energy task forces, contact with the SHPO, and communications for these proposed actions;

NOW, THEREFORE, the signatories agree that Section 106 review shall be conducted in accordance with the following stipulations.

STIPULATIONS

I. For the undertakings of issuing a commercial lease, limited lease, ROW grant, or RUE grant, the signatories agree:

   A. The APE will be defined as the depth and breadth of the seabed that could potentially be impacted by geotechnical testing.

   B. A reasonable and good faith effort to carry out appropriate identification of historic properties within the APE is presented in BOEM's *Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 585* (*Guidelines*; *see* 36 CFR § 800.4(b)(1)). Should BOEM wish to alter any archaeological survey-related information included in the *Guidelines*, BOEM will first consult with the signatories.

C. Prior to lease or grant issuance under this part, BOEM will identify consulting parties, pursuant to 36 CFR 800.3(f). BOEM will consult on existing, non-proprietary information regarding the proposed undertaking and the geographic extent of the APE, as defined in Stipulation I.A. BOEM will also solicit additional information on potential historic properties within the APE from consulting parties and the public.

D. BOEM will treat all identified potential historic properties as eligible for inclusion in the National Register unless BOEM determines, and the SHPO agrees, that a property is ineligible, pursuant to 36 CFR §800.4(c).

E. Where practicable, BOEM will require lessees and grantees to avoid effects to historic properties through lease stipulations, resulting in BOEM recording a finding of No historic properties affected, consistent with 36 CFR § 800.4(d)(1). If effects to historic properties cannot be avoided, BOEM will make a finding of Historic properties affected and follow 36 CFR §800.4(d)(2). Any adverse effects will be resolved by following 36 CFR §800.6.

II. For the undertakings of approving a Plan, except as described under Stipulation IV below, the signatories agree:

A. The APE will be defined as the depth and breadth of the seabed that could potentially be impacted by seafloor/bottom-disturbing activities associated with the undertakings; the onshore viewshed from which renewable energy structures would be visible; and, if applicable, the depth, breadth, and viewshed of onshore locations where transmission cables or pipelines come ashore until they connect to existing power grid structures.

B. The following constitute a reasonable and good faith effort to carry out appropriate identification of historic properties (*see* 36 CFR § 800.4(b)(1)):

1. For the identification of historic properties within the seabed portion of the APE located on the OCS, historic property identification survey results generated in accordance with BOEM's *Guidelines*.

2. For the identification of non-architectural historic properties within the seabed portion of the APE located in state submerged lands or within the onshore terrestrial portion of the APE, historic property identification conducted in accordance with the Office of State Archaeology (OSA) *Guidelines for Preparation of Archaeological Survey Reports in North Carolina*. BOEM will request the developer to coordinate with the SHPO prior to the initiation of any such identification efforts.

3. For the identification of architectural historic properties within the APE, historic property identification conducted by a Qualified Architectural Historian in accordance with the standards laid forth in the North Carolina SHPO's *Architectural Survey Manual, Survey Database Data Entry*

Manual, and *Digital Photography for Historic Property Surveys and National Register Nominations.*

C. Prior to approving a Plan, BOEM will identify consulting parties, pursuant to 36 CFR 800.3(f). BOEM will consult on existing, non-proprietary information regarding the proposed undertaking and the geographic extent of the APE, as defined in Stipulation II.A. BOEM will also solicit from the consulting parties and the public additional information on potential historic properties within the APE.

D. BOEM will review the results of the identification efforts and determine which remote sensing targets and/or anomalies are potential historic properties and which are not. BOEM will treat all identified potential historic properties as eligible for inclusion in the National Register unless BOEM determines, and the SHPO agrees, that a property is ineligible, pursuant to 36 CFR § 800.4(c).

E. Where practicable, as a condition of Plan approval, BOEM will require the lessee to relocate elements of the proposed project that may affect potential historic properties, resulting in BOEM recording a finding of *no historic properties affected*, consistent with 36 CFR§ 800.4(d)(1).

1. If effects to identified properties cannot be avoided, BOEM will evaluate the National Register eligibility of the properties, in accordance with 36 CFR § 800.4(c).

a. If BOEM determines all of the properties affected are ineligible for inclusion in the National Register, and the SHPO agrees, BOEM will make a finding of *no historic properties affected*, consistent with 36 CFR § 800.4(d)(1).

b. If BOEM determines any of the properties affected are eligible for inclusion in the National Register, and the SHPO agrees, BOEM will make a finding of *historic properties affected*, consistent with 36 CFR § 800.4(d)(2), and BOEM will make an assessment of adverse effects, consistent with 36 CFR § 800.5. Any adverse effects will be resolved by following 36 CFR§ 800.6.

c. If the SHPO disagrees with BOEM's determination regarding whether an affected property is eligible for inclusion in the National Register, or if the Council or the Secretary so request, the agency official shall obtain a determination of eligibility from the Secretary pursuant to 36 CFR part 63 (36 CFR§ 800.4(c)(2)).

III. For the undertakings of issuing a Research lease or Interim Policy lease, except as described under Stipulation IV below, the signatories agree that:

A. The APE will be defined as the depth and breadth of the seabed that could potentially be impacted by seafloor/bottom-disturbing activities associated with the undertakings; the onshore viewshed from which renewable energy structures would be visible; and, if applicable, the depth, breadth, and viewshed of onshore locations where transmission cables or pipelines come ashore until they connect to existing power grid structures.

B. The following constitute a reasonable and good faith effort to carry out appropriate identification of historic properties (*see* 36 CFR § 800.4(b)(1)):

1. For the identification of historic properties within the seabed portion of the APE located on the OCS, historic property identification survey results generated in accordance with BOEM's *Guidelines*.

2. For the identification of non-architectural historic properties within the seabed portion of the APE located in state submerged lands or within the onshore terrestrial portion of the APE, historic property identification conducted in accordance with the Office of State Archaeology (OSA) *Guidelines for Preparation of Archaeological Survey Reports in North Carolina*. BOEM will request the developer to coordinate with the SHPO prior to the initiation of any such identification efforts.

3. For the identification of architectural historic properties within the APE, historic property identification conducted by a Qualified Architectural Historian in accordance with the standards laid forth in North Carolina SHPO's *Architectural Survey Manual, Survey Database Data Entry Manual*, and *Digital Photography for Historic Property Surveys and National Register Nominations*.

C. Prior to issuing a research lease or Interim Policy lease under this part, BOEM will identify consulting parties, pursuant to 36 CFR 800.3(f). BOEM will consult on existing, non-proprietary information regarding the proposed undertaking and the geographic extent of the APE, as defined in Stipulation III.A. BOEM also will solicit from the consulting parties and the public additional information on potential historic properties within the APE.

D. BOEM will review the results of the identification efforts and determine which remote sensing targets and/or anomalies are potential historic properties and which are not. BOEM will treat all identified properties as eligible for inclusion in the National Register unless BOEM determines, and the SHPO agrees, that a property is ineligible, pursuant to 36 CFR § 800.4(c).

E. Where practicable, BOEM will require lessees and grantees to avoid effects to historic properties through lease stipulations, resulting in BOEM recording a finding of No historic properties affected, consistent with 36 CFR § 800.4(d)(1). If effects to historic properties cannot be avoided, BOEM will make a finding of Historic properties affected and follow 36 CFR §800.4(d)(2). Any adverse effects will be resolved by following 36 CFR §800.6.

IV. Activities exempt from review. The signatories agree to exempt from Section 106 review the following categories of activities because they have little or no potential to affect an historic property's National Register qualifying characteristics:

A. Archaeological Sampling: Vibracores or other direct samples collected, by or under the supervision of a Qualified Marine Archaeologist, for the purposes—at least in part—of historic property identification or National Register eligibility testing and evaluation.

B. Meteorological Towers and/or Buoys: Proposed construction, installation, and operation of meteorological towers and/or buoys when the results of geophysical data collected meet the standards established in BOEM's *Guidelines* and either: 1) resulted in the identification of no archaeological site within the seabed portion of the APE for the tower and/or buoy, or 2) if the project can be relocated so that the APE does not contain an archaeological site, if any such sites are identified during geophysical survey. The signatories agree that offshore meteorological towers and/or buoys have no effect on onshore historic properties since they are temporary in nature and indistinguishable from lighted vessel traffic.

V. Tribal Consultation. BOEM shall continue to consult with affected Tribes throughout the implementation of this Agreement in a government-to-government manner consistent with Executive Order 13175, Presidential memoranda, and any Department of the Interior policies, on subjects related to the undertakings.

VI. Public Participation

A. Because BOEM and the signatories recognize the importance of public participation in the Section 106 process, BOEM shall continue to provide opportunities for public participation in Section 106-related activities, and shall consult with the signatories on possible approaches for keeping the public involved and informed throughout the term of this Agreement.

B. BOEM shall keep the public informed and may produce reports on historic properties and on the Section 106 process that may be made available to the public at BOEM's headquarters, on the BOEM website, and through other reasonable means insofar as the information shared conforms to the confidentiality clause of this Agreement.

VII. Confidentiality. Because BOEM and the signatories agree that it is important to withhold from disclosure sensitive information such as that which is protected by NHPA Section 304 (16 U.S.C. § 470w-3) and North Carolina G.S 70-18 (e.g., the location, character, and ownership of an historic resource, if disclosure would cause a significant invasion of privacy, risk harm to the historic resources, or impede the use of a traditional religious site by practitioners), BOEM shall:

A. Request that each signatory inform the other signatories if, by law or policy, it is unable to withhold sensitive data from public release.

B. Arrange for the signatories to consult as needed on how to protect such information collected or generated under this Agreement.

C. Follow, as appropriate, 36 CFR § 800.11(c) for authorization to withhold information pursuant to NHPA Section 304, and otherwise withhold sensitive information to the extent allowable by laws including the Freedom of Information Act, 5 U.S.C. § 552, through the Department of the Interior regulations at 43 CFR Part 2 and North Carolina G.S. 70-18.

D. Request that the signatories agree that materials generated during consultation be treated by the signatories as internal and pre-decisional until they are formally released, although the signatories understand that they may need to be released by one of the signatories if required by law.

VIII. Administrative Stipulations

A. In coordinating reviews, BOEM shall follow this process:

1. Standard Review: The signatories shall have a standard review period of thirty (30) calendar days for commenting on all documents which are developed under the terms of this Agreement, from the date they are received by the signatory.

2. Expedited Request for Review: The signatories recognize the time-sensitive nature of this work and shall attempt to expedite comments or concurrence when BOEM so requests. The expedited comment period shall not be less than fifteen (15) calendar days from the date such a request is received by the signatory.

3. If a signatory cannot meet BOEM's expedited review period request, it shall notify BOEM in writing within the fifteen (15) calendar-day period.

4. If a signatory fails to provide comments or respond within the time frame requested by BOEM (either standard or expedited), then BOEM may proceed as though it received concurrence. BOEM shall consider all comments received within the review period.

5. Unless otherwise indicated below, all signatories will send correspondence and materials for review via electronic media unless a signatory requests, in writing, that materials be transmitted by an alternate method specified by that signatory. Should BOEM transmit the review materials by the alternate method, the review period will begin on the date the materials were received by the signatory, as confirmed by delivery receipt.

6. Each signatory shall designate a point of contact for carrying out this Agreement and provide this contact's information to the other signatories, updating it as necessary while this Agreement is in force. Updating a

point of contact alone shall not necessitate an amendment to this Agreement.

B. Dispute Resolution. Should any signatory object in writing to BOEM regarding an action carried out in accordance with this Agreement, or lack of compliance with the terms of this Agreement, the signatories shall consult to resolve the objection. Should the signatories be unable to resolve the disagreement, BOEM shall forward its background information on the dispute as well as its proposed resolution of the dispute to the ACHP. Within forty-five (45) calendar days after receipt of all pertinent documentation, the ACHP shall either: (1) provide BOEM with written recommendations, which BOEM shall take into account in reaching a final decision regarding the dispute; or (2) notify BOEM that it shall comment pursuant to 36 CFR § 800.7(c), and proceed to comment. BOEM shall take this ACHP comment into account, in accordance with 36 CFR § 800.7(c)(4). Any ACHP recommendation or comment shall be understood to pertain only to the subject matter of the dispute; BOEM's responsibility to carry out all actions under this Agreement that is not subjects of dispute shall remain unchanged.

C. Amendments. Any signatory may propose to BOEM in writing that this Agreement be amended, whereupon BOEM shall consult with the signatories to consider such amendment. This Agreement may then be amended when agreed to in writing by all signatories, becoming effective on the date that the amendment is executed by the ACHP as the last signatory.

D. Coordination with other Federal agencies. In the event that another Federal agency believes it has Section 106 responsibilities related to the undertakings which are the subject of this Agreement, BOEM will request to coordinate its review with those other agencies. Additionally, that agency may attempt to satisfy its Section 106 responsibilities by agreeing in writing to the terms of this Agreement and notifying and consulting with the SHPO and the ACHP. Any modifications to this Agreement that may be necessary for meeting that agency's Section 106 obligations shall be considered in accordance with this Agreement.

E. Adding Concurring Parties. In the event that another party wishes to assert its support of this Agreement, that party may prepare a letter indicating its concurrence, which BOEM will attach to this Agreement and circulate among the signatories.

F. Terms of Agreement.

1. This Agreement shall remain in full force for twenty-five (25) years from the date this Agreement is executed, defined as the date the last signatory signs, unless otherwise extended by amendment in accordance with this Agreement. The term is related to the standard length of the operations term of commercial leases, which is given at 30 CFR § 585.235.

2. The signatories agree to meet every five years, beginning from the date the agreement is executed, to discuss the agreement, to determine whether amendment or termination is necessary, and to evaluate the adequacy of information exchange between the parties.

3. If requested by any signatory, the parties will meet or teleconference annually to review activities conducted under the agreement.

4. BOEM agrees to share updated information on renewable energy activities offshore North Carolina via the bureau via the Bureau's state activities webpage at: http://www.boem.gov/State-Activities-North-Carolina and via the Historic Preservation Program Activities webpage at: http://www.boem.gov/Renewable-Energy/Historic-Preservation-Activities, and additionally through the North Carolina Intergovernmental Renewable Energy Task Force of which the SHPO is a member. Notice of updates to the Historic Preservation webpage pursuant to Section 106 activities under this Agreement or relevant to the SHPO will be provided by BOEM to the SHPO via email message to: environmental.review@ncdcr.gov.

G. Termination.

1. If any signatory determines that the terms of this Agreement cannot be carried out or are not being carried out, that signatory shall notify the other signatories in writing and consult with them to seek amendment of the Agreement. If within sixty (60) calendar days of such notification, an amendment cannot be made, any signatory may terminate the Agreement upon written notice to the other signatories.

2. If termination is occasioned by BOEM's final decision on the last Plan considered under the Renewable Energy Regulations, BOEM shall notify the signatories and the public, in writing.

H. Anti-Deficiency Act. Pursuant to 31 U.S.C. § 1341(a)(1), nothing in this Agreement shall be construed as binding the United States to expend in any one fiscal year any sum in excess of appropriations made by Congress for this purpose, or to involve the United States in any contract or obligation for the further expenditure of money in excess of such appropriations.

I. Existing Law and Rights. Nothing in this Agreement shall abrogate existing laws or the rights of any consulting party or signatory to this Agreement.

J. Compliance with Section 106. Execution and implementation of this Agreement evidences that BOEM satisfied its Section 106 responsibilities for all aspects of these proposed undertakings by taking into account the effects of these undertakings on historic properties and affording the ACHP a reasonable opportunity to comment with regard to the undertakings.

AGREED

Execution of this Agreement by BOEM, the SHPO, and the ACHP, and the implementation of its terms are evidence that BOEM has taken into account the effects of renewable energy activities on historic properties.

SIGNATORIES

U.S. Department of the Interior, Bureau of Ocean Energy Management

By: Maureen A. Bornholdt Date: 4-9-14

Maureen A. Bornholdt
Program Manager
Office of Renewable Energy Programs

North Carolina State Historic Preservation Officer

By: Kevin Cherry Date: 5/6/2014

Dr. Kevin Cherry
State Historic Preservation Officer

Advisory Council on Historic Preservation

By: Date: June 6, 2014

John M. Fowler
Executive Director

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APPENDIX F
PHOTOGRAPHIC SIMULATIONS

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