Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf of the Central Atlantic

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Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf of the Central Atlantic

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Executive Summary

ES.1 Purpose and Need for Action

On July 31, 2023, the Bureau of Ocean Energy Management (BOEM) released the Announcement of the Area Identification (Area ID) Memorandum describing the analysis and rationale used to develop the Wind Energy Areas (WEAs) in the Outer Continental Shelf (OCS) of the Central Atlantic (BOEM 2023a). The Central Atlantic is an offshore area extending generally south from offshore Delaware to Cape Hatteras, North Carolina. BOEM partnered with the National Centers for Coastal Ocean Science (NCCOS) to compile best available data and develop spatial models to identify suitable areas for offshore wind energy in the region (NOAA NCCOS 2023). BOEM identified three final WEAs in the Central Atlantic.

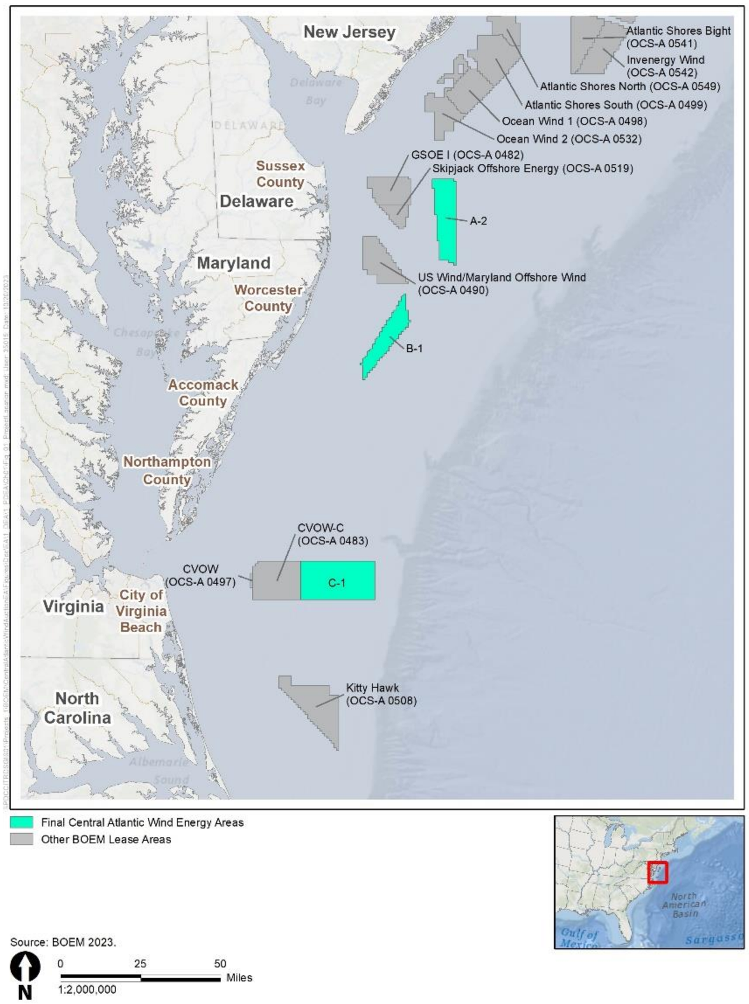

Figure ES-1. Central Atlantic Wind Energy Areas

The purpose of the Proposed Action is to issue commercial leases within the WEAs and grant rights-of-way (ROWs) and rights-of-use and easement (RUEs) in the region to provide lessees the exclusive right to submit to BOEM plans to assess the physical characteristics of areas on the OCS of the Central Atlantic. All final WEAs, depicted in **Figure ES-1,** are considered in this Environmental Assessment (EA). BOEM may decide to issue leases within all of, a portion of, or none of the WEAs analyzed in the EA, and communicates this decision through issuance of a Proposed Sale Notice and Final Sale Notice. On December 12, 2023, BOEM published a Proposed Sale Notice in the *Federal Register* (88 FR 86145), proposing two WEAs for leasing: A-2 and C-1. The EA and associated consultations will inform development of the Final Sale Notice. The EA analyzes all three areas, including WEA B-1, as WEA B-1 may be considered as part of a potential second lease sale in the Central Atlantic.

BOEM's issuance of these leases and grants is needed to (1) confer the exclusive right to submit plans to BOEM for potential development, such that the lessees and grantees would commit to site characterization and site assessment activities necessary to determine the suitability of their leases and grants for commercial offshore wind production and/or transmission; and (2) impose terms and conditions intended to ensure that site characterization and assessment activities are conducted in a safe and environmentally responsible manner.

ES.2 Proposed Action and Alternatives

The Proposed Action for this EA is the issuance of commercial wind energy leases within the WEAs that BOEM has designated on the OCS in the Central Atlantic, and the granting of ROWs and RUEs in support of wind energy development. Issuance of leases and grants would only allow for the submittal of plans for BOEM's consideration and approval, which does not constitute an irreversible and irretrievable commitment of resources. Therefore, BOEM's environmental analysis focused on the effects of site characterization and site assessment activities that take place after the issuance of commercial wind energy leases. This EA analyzes BOEM's issuance of up to four leases that may cover the entirety of the WEAs, the issuance of potential easements associated with each lease, and the issuance of grants for subsea cable corridors and associated offshore collector/converter platforms. The ROWs, RUEs, and potential easements would all be located within the Central Atlantic and may include corridors that extend from the WEAs to the onshore energy grid. The Proposed Action would result in site assessment activities on leases and site characterization activities on the leases, grants, and potential easements. The EA analyses include site assessment and site characterization activities for potential corridors. Site assessment activities would most likely include the temporary placement of meteorological (met) buoys and oceanographic devices. Site characterization activities would most likely include geophysical, geotechnical, and biological surveys. The Proposed Action includes site characterization activities within the WEAs and between the WEAs and shore along the potential transmission cable corridors.

In this EA, BOEM analyzes two alternatives (**Table ES-1**).

Table ES-1. Alternatives analyzed in detail

Alternative	Description
Alternative A – No Action	Under Alternative A, no leases or grants would be issued in the Central Atlantic at this time. Some site characterization surveys (e.g., biological surveys) and off-lease site assessment activities do not require BOEM approval and could still be conducted under Alternative A, but these activities would not be likely to occur without a commercial wind energy lease or grant. Alternative A includes other ongoing activities and reasonably foreseeable future (planned) actions (**Appendix D**) occurring in the same geographic area and timeframe (5 to 7 years after first lease issuance).
Alternative B (Preferred Alternative) – Offer some or all the WEAs for lease and adjacent areas for grants	Under Alternative B, lease issuance, site characterization, and site assessment activities could occur in the WEAs for which leases are offered, and between the WEAs for which leases are offered and shore along the potential transmission cable corridors.

BOEM = Bureau of Ocean Energy Management; WEA = Wind Energy Area.

ES.3 Foreseeable Activities and Impact-Producing Factors

The analysis covers the effects of routine and non-routine activities associated with lease and grant issuance, site characterization activities, and site assessment activities within the WEAs. This EA uses a reasonably foreseeable scenario of site characterization surveys and site assessment activities that could be conducted as a result of the Proposed Action. These scenarios are based on the requirements of the renewable energy regulations at 30 Code of Federal Regulations (CFR) Part 585, BOEM's guidance for lessees, previous lease applications and plans that have been submitted to BOEM, and previous EAs prepared for similar activities. Reasonably foreseeable non-routine events, low-probability events, and hazards that could occur during lease issuance related activities include (1) severe storms, such as hurricanes and extratropical cyclones; (2) allisions and collisions between the site assessment structure or associated vessels and other marine vessels or marine life; (3) spills from collisions or fuel spills resulting from generator refueling; and (4) recovery of lost survey equipment.

The analysis did not consider construction and operation of any commercial wind power facilities within the Central Atlantic WEAs, the latter of which would be evaluated as part of a separate National Environmental Policy Act (NEPA) process if a lessee submits a Construction and Operations Plan (COP).

Impact-producing factors (IPFs) associated with the various activities in the Proposed Action that could affect resources include the following:

- Noise
- Air Emissions
- Lighting
- Habitat Degradation
- Vessel Traffic
- Routine Vessel Discharges
- Bottom Disturbance
- Entanglement

ES.4 Environmental Consequences

This EA uses a four-level classification scheme (negligible, minor, moderate, and major) to characterize the environmental impacts predicted for each alternative. **Table ES-2** summarizes potential impacts that could occur under the Proposed Action (Alternative B). Under Alternative A (No Action), any potential environmental and socioeconomic impacts, including benefits, associated with Alternative B (Proposed Action) would not occur; however, impacts could occur from other ongoing or future planned actions (**Section 3**).

Table ES-2. Summary of impact determinations for Alternative B: Proposed Action

Resource	Impact Determination: Alternative B (Proposed Action)		
	Routine Activities		Non-Routine Events
	Site Assessment	Site Characterization	
Air Quality and Greenhouse Gas Emissions	Negligible	Negligible	Negligible
Benthic Resources	Negligible to Minor	Negligible to Minor	Negligible
Commercial and Recreational Fishing	Negligible to Minor	Negligible to Minor	Negligible

Resource	Impact Determination: Alternative B (Proposed Action)		
	Routine Activities		Non-Routine Events
	Site Assessment	Site Characterization	
Cultural, Historical, and Archaeological Resources	Negligible	Negligible	Negligible
Finfish, Invertebrates, and Essential Fish Habitat	Negligible	Negligible to Minor	Negligible
Marine Mammals	Negligible to Minor	Negligible to Minor	Negligible
Military Use and Navigation/Vessel Traffic	Negligible	Negligible	Negligible
Recreation and Tourism	Negligible	Negligible	Negligible
Sea Turtles	Negligible	Negligible to Minor	Negligible

Note: Site assessment activities include meteorological buoy deployment, operation, and decommissioning; site characterization activities include biological, geological, geotechnical, and archaeological surveys.

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List of Abbreviations and Acronyms

µPa	micropascal
ACHP	Advisory Council on Historic Preservation
ADCP	Acoustic Doppler Current Profilers
Area ID	Area Identification
ASMFC	Atlantic States Marine Fisheries Commission
ATON	Aid to Navigation
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
Call	Call for Information and Nominations
CD	Consistency Determination
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CHIRP	Compressed High-Intensity Radiated Pulse
CIER	Center for Integrative Environmental Research
COP	Construction and Operations Plan
CPAPARS	Consolidated Port Approaches Port Access Route Studies
CPT	cone penetration test
CVOW-C	Coastal Virginia Offshore Wind Commercial
dB	decibels
DoD	U.S. Department of Defense
DWR	deep-water route
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FR	*Federal Register*
FSN	final sale notice
G&G	Geological and Geophysical
HAPC	Habitat Area of Particular Concern
HRG	high-resolution geophysical
Hz	hertz
IPF	impact-producing factor
ITA	incidental take authorization
kg	kilogram
km	kilometer
LoC	Letter of Confirmation
MAFMC	Mid-Atlantic Fishery Management Council
MEC	Munitions and Explosives of Concern
met	meteorological
MMPA	Marine Mammal Protection Act
MOU	memorandum of understanding

NARW	North Atlantic right whale
NASA	National Aeronautics and Space Administration
NCCOS	National Centers for Coastal Ocean Science
NEFMC	New England Fishery Management Council
NEPA	National Environmental Policy Act
NGOs	non-governmental organizations
NHPA	National Historic Preservation Act
nm	nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOPR	Notice of Proposed Rulemaking
NWP	Nationwide Permit
OCS	Outer Continental Shelf
OPAREAs	Operation Areas
PARS	Port Access Route Studies
PATON	Private Aid to Navigation
PDCs	project design criteria
PEIS	Programmatic Environmental Impact Statement
PK	zero-to-peak sound pressure level
PSO	protected species observer
PTS	permanent threshold shift
ROW	right-of-way
RUE	right-of-use and easement
SAP	Site Assessment Plan
SAV	submerged aquatic vegetation
SBP	sub-bottom profiler
SEL	sound exposure level
SHPO	State Historic Preservation Office
SOC	Standard Operating Condition
SPL	sound pressure level
Task Force	BOEM’s Central Atlantic Intergovernmental Renewable Energy Task Force
TSSs	Traffic Separation Schemes
UME	unusual mortality event
USACE	U.S. Army Corps of Engineers
USBL	ultra-short baseline
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UXO	unexploded ordnance
VACAPES	Virginia Capes Range Complex and Operating Area and Range Complex
WEA	Wind Energy Area

1 Purpose and Need for Action

The U.S. Department of the Interior's Bureau of Ocean Energy Management (BOEM) has prepared this Environmental Assessment (EA) to determine whether the issuance of a lease and grants within the Wind Energy Areas (WEAs) in the Central Atlantic would lead to reasonably foreseeable significant impacts on the environment and, thus, whether an environmental impact statement should be prepared before any leases are issued.

On July 31, 2023, BOEM released the Announcement of the Area Identification (Area ID) Memorandum (BOEM 2023a). The Area ID Memorandum documents the analysis and rationale used to develop the WEAs in the Central Atlantic. The Central Atlantic is an offshore area extending generally south from offshore Delaware to Cape Hatteras, North Carolina. BOEM partnered with the National Centers for Coastal Ocean Science (NCCOS) to compile best available data and develop spatial models to identify suitable areas for offshore wind energy in the region (NOAA NCCOS 2023). BOEM identified three final WEAs in the Central Atlantic. The purpose of the Proposed Action is to issue commercial leases within the WEAs and granting of rights-of-way (ROWs) and rights-of-use and easement (RUEs) in the region of the Outer Continental Shelf (OCS) of the Central Atlantic. BOEM's issuance of these leases and grants is needed to (1) confer the exclusive right to submit plans to BOEM for potential development, such that the lessees and grantees develop plans for BOEM's review and will commit to site characterization and site assessment activities necessary to determine the suitability of their leases and grants for commercial offshore wind production and/or transmission; and (2) impose terms and conditions intended to ensure that site characterization and assessment activities are conducted in a safe and environmentally responsible manner. The issuance of a lease by BOEM to the lessee conveys no right to proceed with development of a wind energy facility; the lessee acquires only the exclusive right to submit one or more plans to conduct this activity.

Based on the process described in the Area ID Memorandum (BOEM 2023), the WEAs considered in this Draft EA are described in **Table 1-1** and depicted in **Figure 1-1**. For the purposes of impact assessment, BOEM is assuming lease areas of approximately 80,000 acres each, which, based on the acreage of the three WEAs, would correspond to four lease areas, one in WEA A-2, one in WEA B-1, and two in WEA C-1. BOEM has deferred WEA identification in deepwater areas at this time. BOEM may decide to issue leases within all of, a portion of, or none of the WEAs analyzed in the EA, and communicates this decision through issuance of a Proposed Sale Notice and Final Sale Notice. On December 12, 2023, BOEM published a Proposed Sale Notice,[1] proposing two WEAs for leasing: A-2 and C-1. The EA and associated consultations will inform development of the Final Sale Notice. The EA analyzes all three areas, including WEA B-1, as WEA B-1 may be considered as part of a potential second lease sale in the Central Atlantic.

As part of BOEM's ongoing coordination with the U.S. Department of Defense (DoD) and the National Aeronautics and Space Administration (NASA), an in-depth review of WEA B-1 will continue to determine if their activities could co-exist with wind energy development. The results of the final in-

[1] https://www.federalregister.gov/documents/2023/12/12/2023-27200/atlantic-wind-lease-sale-10-for-commercial-leasing-for-wind-power-development-on-the-us-states.

depth assessment from DoD and NASA will be used to inform whether WEA B-1 should be included in a potential second lease sale, which would be the next step in the wind energy process. There would be another public comment period if BOEM decides to move forward with a proposed lease sale, and, if Area WEA B-1 is included in a proposed lease sale, any necessary mitigation would be identified to inform bidders in advance of a future sale. After a thorough review of the constraints and mitigations that would be necessary to keep WEA B-1 viable during an initial Central Atlantic offshore wind sale, the team identified that the magnitude and cost of collective mitigation needed to accommodate offshore wind construction and operations in this area would be significant. BOEM decided to remove WEA B-1 from consideration as part of the upcoming Central Atlantic lease sale due to the significant costs and mitigation that would be required, and it is not included in the Proposed Sale Notice. More detailed information on the compatibility assessments can be found on BOEM's website at https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/Central%20Atlantic%20Appendix%20B%20WEA%20Final%20Report%20NCCOS.pdf

Table 1-1. Central Atlantic Wind Energy Areas descriptive statistics

Parameter	A-2	B-1	C-1	TOTAL
Acres	101,769	78,283	176,493	**356,545**
Maximum depth (m)	48	40	148	**N/A**
Minimum depth (m)	27	21	25	**N/A**
Closest distance to Delaware (nm)	26.4	24.5	87.2	**N/A**
Closest distance to Maryland (nm)	28.9	18.9	61.1	**N/A**
Closest distance to Virginia (nm)	43.4	19.0	30.9	**N/A**
Closest distance to North Carolina (nm)	128.3	89.9	35.4	**N/A**

m = meter; N/A = not applicable; nm = nautical mile.

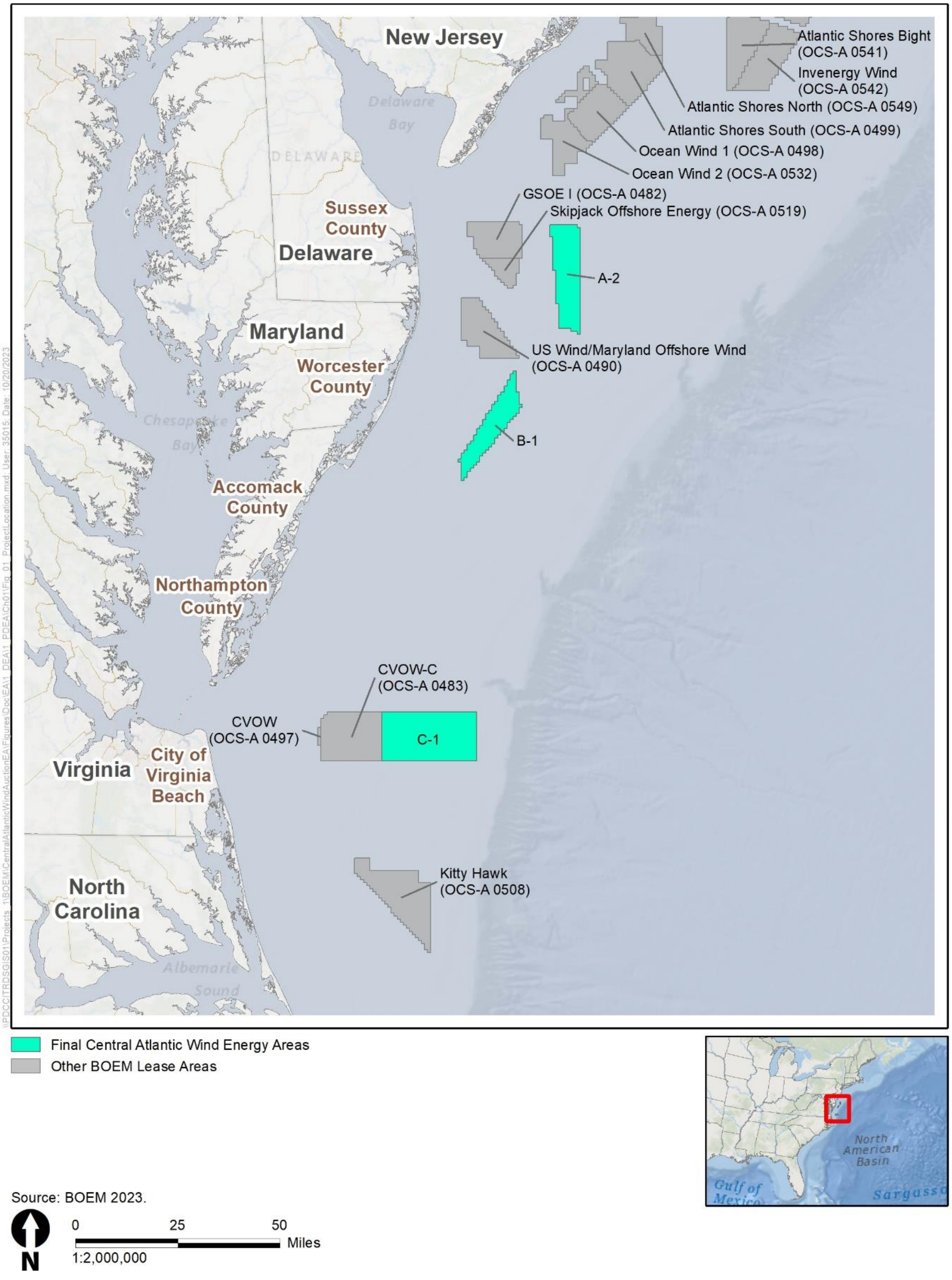

Figure 1-1. Central Atlantic Wind Energy Areas

2 The Proposed Action and Alternatives

The Proposed Action is to offer for lease all or some of the WEAs described in **Section 1** (**Table 1-1**; **Figure 1-1**) for commercial wind energy development and to grant ROWs and RUEs in support of wind energy development. Under the Proposed Action, BOEM would potentially issue leases that may cover the entirety of the WEAs, issue easements associated with each lease, and issue grants for subsea cable corridors and associated offshore collector/converter platforms. The ROWs, RUEs, and potential easements would all be located within the Central Atlantic and may include corridors that extend from the WEAs to the onshore energy grid. This Draft EA analyzes the reasonably foreseeable effects of activities that are anticipated to occur from the Proposed Action, including site assessment activities on leases and site characterization activities on the leases, grants, and potential easements. Site assessment activities would most likely include the temporary placement of meteorological (met) buoys and oceanographic devices.

To measure the speed and direction of ocean currents, Acoustic Doppler Current Profilers (ADCP) would likely be installed on met buoys or the ocean floor. The 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 zooplanktons suspended in the water column. The ADCPs may be mounted independently on the seafloor or attached to a buoy. A seafloor mounted ADCP would likely be located near the meteorological buoy (within approximately 500 feet) and would be connected by a wire that is buried into the ocean bottom. A typical ADCP has 3 to 4 acoustic transducers that emit and receive acoustical pulses from different directions, with frequencies ranging from 300-600 kHz with a sampling rate of 1 to 60 minutes. A typical ADCP is about one to two feet tall and one to two feet wide. Its mooring, base, or cage (surrounding frame) would be several ft wider.

A met buoy could also accommodate environmental monitoring equipment such as avian monitoring equipment (e.g., thermal imaging cameras, MOTUS receivers, etc.), acoustic monitoring for marine mammals, data logging computers, visibility sensors, water measurements (e.g., temperature, conductivity salinity), and communications equipment.

Activities included within the Proposed Action of this Draft EA do not include the installation of met towers, as met buoys have become the preferred metocean data collection platform for developers. Site characterization activities would most likely include geophysical, geotechnical, and biological surveys.

This analysis does not consider construction and operation of any commercial wind power facilities, which would be evaluated if a lessee submits a Construction and Operations Plan (COP). BOEM takes this approach based on several factors. First, BOEM does not consider the issuance of a lease to constitute an irreversible and irretrievable commitment of agency resources. The issuance of a lease only grants the lessee the exclusive right to submit to BOEM one or more plans proposing development of the leasehold; the lease does not, by itself convey rights to proceed with development of a wind energy facility. After lease issuance, a lessee would conduct surveys and, if authorized to do so, install meteorological measurement devices (e.g., met buoys) to characterize the site's environmental and socioeconomic resources and conditions and to assess the wind resources in the proposed lease area. A lessee would collect this information to determine whether the site is suitable for commercial development and, if so, submit a COP with its project-specific design parameters for BOEM's review.

Should a lessee submit a COP, BOEM would consider its merits; perform the necessary consultations with the appropriate Tribal, state, Federal, and local entities; solicit input from the public and the Central Atlantic Intergovernmental Renewable Energy Task Force (Task Force); and perform an independent, comprehensive, site- and project-specific National Environmental Policy Act (NEPA) analysis. This separate site- and project-specific NEPA analysis may take the form of an environmental impact statement (EIS) and would provide additional opportunities for public involvement pursuant to NEPA and the Council on Environmental Quality (CEQ) regulations at 40 Code of Federal Regulations (CFR) Parts 1500–1508. BOEM would use this information to evaluate the potential environmental and socioeconomic consequences associated with the lessee-proposed project when considering whether to approve, approve with modification, or disapprove a lessee's COP pursuant to 30 CFR 585.628. After lease issuance but prior to COP approval, BOEM retains the authority to prevent the environmental impacts of a commercial wind power facility from occurring. BOEM would do this by disapproving a COP for failure to meet the statutory standards set forth in the Outer Continental Shelf Lands Act.

Second, BOEM does not consider the impacts resulting from the development of a commercial wind power facility within the WEA to be reasonably foreseeable at this time. Based on the experiences of the offshore wind industry in northern Europe, project design and the resulting environmental impacts are often geography- and design-specific, and it would therefore be premature to analyze environmental impacts related to potential approval of any future COP at this time (Michel et al. 2007; Musial and Ram 2010). A number of design parameters would be identified in a project proposal, including turbine size, foundation type, project layout, installation methods, and associated onshore facilities. However, the development of these parameters would be determined by information collected by the lessee during site characterization and site assessment activities, and potential advances in technology during the extensive time period between lease issuance and COP approval. Each design parameter, or combination of parameters, would have varying environmental effects. Therefore, additional analyses under NEPA would be required before any future decision is made regarding construction of wind energy facilities on the OCS.

The timing of lease issuance, as well as weather and sea conditions, would be the primary factors influencing timing of site characterization and site assessment activities. Under the reasonably foreseeable site characterization scenario, the sale date is planned for July 24, 2024, and the final sale notice (FSN) is to be published 45 days prior. BOEM could issue leases as early as mid- to late-2024 and continue through 2025. It is assumed lessees would begin survey activities as soon as possible after receiving a lease and preparing plans for submission to BOEM, and when sea states and weather conditions allow for site characterization and site assessment activities. The most suitable sea states and weather conditions would occur from April to August (Atlantic Renewable Energy Corporation and AWS Scientific Inc. 2004). For leases issued in July through September 2024, the earliest surveys would likely begin no sooner than April 2025. Lessees have up to 5 years to perform site characterization and site assessment activities before they must submit a COP (30 CFR §585.235(a)(2)). For leases issued in October through December 2024, those lessees' surveys could continue through August 2029 prior to submitting their COPs.

Of the alternatives considered in this Draft EA, Alternative A is the No Action Alternative, which includes other ongoing activities and future planned actions. Alternative B, the Proposed Action, would result in site characterization and assessment activities in the identified WEAs of the Central Atlantic and along offshore export cable corridors to shore. The two alternatives were analyzed by BOEM, in full, in this Draft EA. The alternatives are described in **Section 2.1**.

2.1 Alternatives Considered

This section describes the No Action Alternative and one action alternative for lease and grant issuance, site characterization, and site assessment activities within the WEAs and along the potential transmission cable corridors of the Central Atlantic. The alternatives are described in the following sections.

2.1.1 Alternative A – No Action

Under the No Action Alternative, no wind energy leases would be issued, and site assessment activities undertaken by lessees would not occur within the identified WEAs of the Central Atlantic. Although some site characterization surveys (e.g., geological, geophysical, biological, and archaeological surveys that are conducted on unleased or ungranted areas of the OCS) and site assessment activities do not require BOEM approval and could still be conducted under Alternative A, these activities are less likely to occur without a commercial wind energy lease. The No Action Alternative sections include a description of the baseline conditions of the affected environment for each resource. These descriptions also include a discussion of how the affected environment or baseline for each resource may change, evolve, or shift (i.e., the trajectory of the resource) absent the Proposed Action (Alternative B). The trajectory of each resource is influenced by other present (ongoing) and reasonably foreseeable future (planned) actions (**Section 3.3** and **Appendix D**). These other ongoing and planned actions that contribute to the No Action baseline will be addressed, along with impacts on the resources from those actions, with a focus on effects that are reasonably foreseeable and overlap in time and space with those of the Proposed Action (5 to 7 years after first lease issuance). Alternative A will serve as the shifting baseline (reflecting changes over time as a result of ongoing and planned actions) against which the action alternative (Alternative B – Proposed Action) is evaluated.

2.1.2 Alternative B – Proposed Action/Preferred Alternative

Alternative B was developed as a result of extensive coordination with the Central Atlantic Intergovernmental Renewable Energy Task Force (BOEM 2022a); relevant consultations with Federal, state, and local agencies; and extensive input from the public and potentially affected stakeholders as described in the Area ID Memorandum (BOEM 2023a). BOEM partnered with the National Centers for Coastal Ocean Science (NCCOS) to compile best available data and develop spatial models to identify suitable areas for offshore wind energy in the region (NOAA NCCOS 2023).

Alternative B (the Preferred Alternative/Proposed Action) is the issuance of commercial wind energy leases and site characterization and site assessment activities within one or more of the WEAs as identified in **Figure 1-1,** and the granting of ROWs and RUEs in support of wind energy development in one or more of the WEAs. The three WEAs total approximately 356,545 acres. The first WEA (A-2) is 101,769 acres and located approximately 26.4 nautical miles (nm) from Delaware Bay. The second WEA (B-1) is 78,283 acres and about 18.9 nm offshore Ocean City, Maryland. The third WEA (C-1) is 176,493 acres and located about 30.9 nm from the mouth of the Chesapeake Bay, offshore Virginia. For the purposes of impact assessment, BOEM is assuming lease areas of approximately 80,000 acres each, which, based on the acreage of the three WEAs, would correspond to four lease areas, one in WEA A-2, one in WEA B-1, and two in WEA C-1. The impact analyses under Alternative B in this EA include potential impacts of lessee site assessment and site characterization activities for lease issuance for all three WEAs.

Alternative B assumes that each lessee would undertake the largest expected number of site characterization surveys (i.e., shallow hazards, geological, geotechnical, archaeological, and biological surveys) in the WEAs for which leases are offered. Under Alternative B, assuming that the lessee chooses to install met buoys, BOEM anticipates that no more than two met buoys would be installed within a proposed lease. BOEM anticipates that each lease could have up to two transmission cable routes (for connecting future wind turbines to an onshore power substation)..

Impacts from Alternative B were analyzed using the shifting baseline (reflecting changes to the affected environment as it shifts over the course of the Proposed Action) for each resource that is presented under the No Action Alternative. Potential direct and indirect impacts of activities associated with Alternative B are determined separately from cumulative impacts (impacts resulting from Alternative B in combination with ongoing and planned actions) (**Section 3.3** and **Appendix D**).

Under Alternative B, BOEM would require each lessee to avoid or minimize potential impacts on the environment by complying with various requirements. These requirements are referred to as Standard Operating Conditions (SOCs) (**Section 4**) and would be implemented through lease stipulations. The impacts of Alternative B on environmental and socioeconomic resources are described in detail in **Section 3.4**.

Impacts from installation, construction, and operation of a full-scale wind energy facility in WEAs A-2, B-1, and C-1 are outside the scope of the analysis for the Proposed Action and, therefore, are not analyzed in the EA. Effects associated with site assessment and site characterization activities are the focus of this EA and include multiple actions that are intended to aid a future NEPA analysis for a wind energy facility in the event a developer proposes one. The purpose of this NEPA analysis is to identify potential effects on resources, including wildlife species, from the Proposed Action.

2.2 Alternatives Considered but Dismissed

Through the Area ID process, the WEAs underwent significant winnowing as a result of extensive coordination with the Task Force; relevant consultations with Federal, state, and local agencies; and extensive input from the public, potentially affected stakeholders, and potential developers, due to concerns related to visual and historic properties, marine protected species, existing cables, recreational and commercial fishing, and vessel navigation (**Section 5.1.1**). On July 28, 2023, BOEM released the Area ID Memorandum (BOEM 2023a), which documents the analysis and rationale used to develop recommendations for WEAs in the Central Atlantic. Because of the winnowing that has already occurred and because the Proposed Action will not result in the approval of a wind energy facility and is expected to result only in site assessment and site characterization activities, BOEM has not identified any action alternatives that could result in meaningful differences in impacts on the various resources analyzed in this Draft EA.

2.3 Information Considered and Supporting National Environmental Policy Act Evaluations

Information considered in scoping this Draft EA includes the following:

- Comments received in response to the April 29, 2022, Call for Information and Nominations (Call) associated with wind energy planning in the Central Atlantic
- Public response to the November 16, 2022 Notice for Comment of Draft Wind Energy Areas on the Central Atlantic Outer Continental Shelf, associated with the analysis and rationale used to develop the Draft WEAs
- Public response to the August 1, 2023, Notice of Intent (NOI) to prepare this EA
- Ongoing consultation and coordination with the members of BOEM's Central Atlantic Intergovernmental Renewable Energy Task Force (Task Force)
- Ongoing or completed consultations with other Federal agencies, including the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), DoD, and U.S. Coast Guard (USCG)
- Research and review of current relevant NEPA documents that assess similar activities, as well as relevant scientific and socioeconomic literature (**Table 2-1**)

Table 2-1. Relevant regulatory documents and literature considered in this Environmental Assessment and incorporated by reference where appropriate

Reference	Link
Other Relevant Lease Issuance and Site Assessment Activities Environmental Assessments (EAs)	
Central Atlantic	
BOEM. 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. 366 p. Report No.: OCS EIS/EA BOEM 2012-003.	www.boem.gov/sites/default/files/uploadedFiles/BOEM/Renewable_Energy_Program/Smart_from_the_Start/Mid-Atlantic_Final_EA_012012.pdf
North Carolina	
BOEM. 2015a. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina, Revised Environmental Assessment. 353 p. Report No.: OCS EIS/EA BOEM 2015-038.	www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/NC/NC-EA-Camera-FONSI.pdf
Siting Analyses	
Central Atlantic	
Randall. A., et al. 2023. A Wind Energy Area Siting Analysis for the Central Atlantic Call Area. Alyssa L. Randall, Jonathan A. Jossart, Brandon M. Jensen, Bridgette H. Duplantis, and James A. Morris, Jr. Sterling, Virginia.	https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/Central%20Atlantic%20Appendix%20B%20WEA%20Final%20Report%20NCCOS.pdf
Other Relevant Wind Energy Documents	
Central Atlantic	
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Ecology and Environment Inc. 2014. Development of Mitigation Measures to Address Potential Use Conflicts between Commercial Wind Energy Lessees/Grantees and Commercial Fishermen on the Atlantic Outer Continental Shelf Final Report on Best Management Practices and Mitigation Measures. 98 p. Report No. OCS Study BOEM 2014-654.	www.boem.gov/sites/default/files/renewable-energy-program/Fishing-BMP-Final-Report-July-2014.pdf
Parsons G, Firestone J. 2018. Atlantic Offshore Wind Energy Development: Values and Implications for Recreation and Tourism. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 52 p. Report No.: OCS Study BOEM 2018-013.	espis.boem.gov/final%20reports/5662.pdf
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North Carolina	https://www.boem.gov/renewable-energy/state-activities/north-carolina-activities
Other Relevant Survey Activity NEPA Evaluations	
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Maryland	https://energy.maryland.gov/Pages/Info/renewable/offshorewind-resources.aspx
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Bradley G. Stevens and Wilmelie Cruz-Marrero. 2015. Assessment of Marine Renewable Energy Installation Siting, Final Project Report – December, 2015 University of Maryland Eastern Shore, Princess Anne, MD 21853	https://energy.maryland.gov/Documents/AssessmentMarineRenewableEnergyInstallationSiting.pdf
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Cornell University. 2018. Understanding Whale Presence in the Virginia Offshore Wind Energy Area using Passive Acoustic, Cornell University Bioacoustics Program, Ithaca New York, 2018.	https://www.boem.gov/Understanding-Whale-Presence-Virginia-Offshore-Wind-Energy-Area-using-Passive-Acoustic/
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McNeilan, Thomas, Smith, Kevin R. and Fisher, James. 2013. Regional Geophysical Survey and Interpretive Report for the Virginia Wind Energy Area offshore Southeastern Virginia. OCS Study BOEM 2013-220. Prepared by Fugro Consultants for BOEM and Virginia Department of Mines, Minerals, and Energy, November 2013.	https://www.boem.gov/Virginia-WEA-Survey/
North Carolina	
Carrier, B. et al. 2017. North Carolina Collaborative Archaeological Survey: Kitty Hawk Wind Energy Area. OCS Study BOEM 2017-070. Prepared by Brandi Carrier, Nick DeLong, Joseph Hoyt, William Hoffman, and William Sassorossi. Prepared for BOEM and NOAA Office of National Marine Sanctuaries October 2017.	https://espis.boem.gov/final%20reports/5633.pdf
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Spiegel CS, Berlin AM, Gilbert AT, Gray CO, Montevecchi WA, Stenhouse IJ, Ford SL, Olsen GH, Fiely JL, Savoy L, Goodale MW, Burke CM. 2017. Determining Fine-scale Use and Movement Patterns of Diving Bird Species in Federal Waters of the Mid-Atlantic United States Using Satellite Telemetry. 291 p. OCS Study BOEM 2017-069. Obligation No.: M12PG00005.	https://espis.boem.gov/final%20reports/5635.pdf
Robinson Willmott J, Forcey G, Vukovich M, McGovern S, Clerc J, Carter J. 2020. Ecological Baseline Studies of the US Outer Continental Shelf: Final Report. Gainesville (FL): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2021-079. 1,013 pp.	https://espis.boem.gov/final%20reports/BOEM_2021-079.pdf

BOEM = Bureau of Ocean Energy Management; MMS = Minerals Management Service; OCS = Outer Continental Shelf; NOAA = National Oceanic and Atmospheric Administration OREP = Office of Renewable Energy Programs.

2.4 Assumptions for the Proposed Action

BOEM's assumptions for the Proposed Action (Alternative B) scenario in this Draft EA are summarized in **Table 2-2** and **Table 2-3**, and estimated quantification of survey effort is provided in **Appendix A**. This scenario is based on the requirements of the renewable energy regulations at 30 CFR Part 585, BOEM's guidance for lessees, previous lease applications and plans that have been submitted to BOEM, previous EAs prepared for similar activities (**Section 2.3**), and the biological assessment evaluating the effects of survey and data collection activities associated with renewable energy on the Atlantic OCS (Baker and Howson 2021). Unless otherwise noted, assumptions in this section are based on these sources.

Table 2-2. Assumptions for the Proposed Action (Alternative B) scenario[1]

Overall Scenario Assumptions
BOEM would issue leases within the WEAs of 80,000 acres each (WEAs A-2 and B-1 are large enough to achieve this area; WEA C-1 is large enough for two such areas).
A lessee would install up to two met buoys per lease.
There would be up to two offshore export cable route corridors per lease. Site characterization activities would include the WEAs and potential offshore cable route corridors.
Surveying and Sampling Assumptions
Reconnaissance site characterization surveys would likely begin within 1 year following execution of lease along with any additional surveys that may be required prior to installing a met buoy[2]. Site characterization surveys would then continue in a phased approach for up to 5 years leading up to the preparation and submittal of the COP. Under the current BOEM regulations the lessee must receive BOEM approval of a SAP before installing one or more met buoys. BOEM has proposed eliminating the SAP requirement for met buoys in an ongoing rulemaking as described in footnote 2.
Lessees would likely survey the entire proposed lease area during the 5-year site assessment term to collect required geophysical and geotechnical information for siting of commercial facilities (wind turbines and offshore export cables). The surveys are typically completed in phases starting with reconnaissance surveys.
Seabed sampling (CPTs, vibracores, grab samples, SPI) of the WEA would require a seabed sample at every potential wind turbine location (which would only occur in the portion of the WEA where structural placement is allowed) and one sample per kilometer of offshore export cable corridor. Sampling will also be conducted at locations where offshore collector and/or converter platforms are proposed. The amount of effort and number of vessel trips required to collect the geotechnical samples varies greatly by the type of technology used to retrieve the sample. Benthic sampling could also include nearshore, estuarine, and SAV habitats along the offshore export cable routes.
Lessees would be required to comply with SOCs developed to avoid and minimize adverse effects on resources (**Section 4**).

[2] BOEM regulations currently require lessees to submit a SAP, which must include data from site characterization surveys 30 CFR § 585.605. BOEM and BSEE's proposed Renewable Energy Modernization Rule published in the *Federal Register* on January 30, 2023 (88 FR 5968) (https://www.federalregister.gov/documents/2023/01/30/2023-00668/renewable-energy-modernization-rule) would eliminate the SAP requirement for met buoys because the SAP process is duplicative with USACE's long-standing permitting process under Section 404(e) of the Clean Water Act (33 U.S.C. 1344(e)) and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401 *et seq.*) for the installation of met buoys, which are categorized by the USACE as "scientific measurement devices."

Installation, Decommissioning, and Operations and Maintenance Assumptions
Met buoy installation and decommissioning would likely take approximately 1 day each.
Met buoy installation and decommissioning would likely occur between April and August (due to weather).
Met buoy installation would likely occur in Year 2 after lease execution.
Met buoy decommissioning would likely occur in Year 6 or Year 7 after lease execution.
Assumptions for Generation of Noise
Under the Proposed Action, the following activities and equipment would generate noise: HRG survey equipment and vessel engines during site characterization surveys and met buoy installation, operations and maintenance, and decommissioning.
Assumptions for Port Usage
Vessel traffic associated with the Proposed Action would be split between ports in New Jersey, Delaware, Maryland, and Virginia, and no expansion of these ports is expected in support of the Proposed Action. Vessels could use the following general port locations: Atlantic City, New Jersey; Wilmington, Delaware; Delaware City, Delaware; Lewes, Delaware; Ocean City, Maryland; Baltimore, Maryland; and Portsmouth/Hampton Roads/Newport News/Norfolk, Virginia.

[1] BOEM has issued a Notice of Proposed Rulemaking (NOPR) for a proposed rule to modernize its regulations (88 *FR* 5968 - *Renewable Energy Modernization Rule)* - requirements identified in Table 2-2 may change if the proposed modernization rule is finalized.
https://www.federalregister.gov/documents/2023/01/30/2023-00668/renewable-energy-modernization-rule.

BOEM = Bureau of Ocean Energy Management; COP = Construction and Operations Plan; CPT = cone penetration test; HRG = high-resolution geophysical; met = meteorological; SAP = Site Assessment Plan; SAV = submerged aquatic vegetation; SOC = Standard Operating Conditions; SPI = sediment profile imaging; WEA = Wind Energy Area.

Table 2-3. Typical equipment that would be used for surveys associated with the Proposed Action (Alternative B)

Survey Type	Survey Equipment and/or Method	Resource Surveyed or Information Used to Inform
High-resolution geophysical surveys	Sub-bottom profiler, side-scan sonar, multibeam echosounder, magnetometer	Shallow hazards,[a] archaeological,[b] bathymetric charting, benthic habitat
Geotechnical/ seafloor sampling[c]	Vibracores, deep borings, cone penetration tests	Geological[d]
Biological[e]	Grab sampling, benthic sled, underwater imagery/sediment profile imaging	Benthic habitat
Biological[e]	Aerial digital imaging, visual observation from boat or airplane	Avian
Biological[e]	Ultrasonic detectors installed on survey vessels used for other surveys	Bat
Biological[e]	Visual observation from boat or airplane	Marine fauna (marine mammals and sea turtles)
Biological[e]	Direct sampling of fish and invertebrates	Fish

[a]30 CFR §585.610(b)(2) and 30 CFR §585.626(a)(1)
[b]30 CFR §585.626(a) and 30 CFR §585.610–585.611
[c]30 CFR §585.610(b)(1) and 30 CFR §585.626(a)(4)
[d]30 CFR §585.610(b)(4) and 30 CFR §585.616(a)(2)
[e]30 CFR §585.610(b)(5) and 30 CFR §585.626(a)(3)

2.4.1 High-Resolution Geophysical Surveys

High-resolution geophysical (HRG) survey data provides information on seafloor and sub-surface conditions as they pertain to the project siting and design. This includes shallow geologic and anthropogenic hazards, like the presence or absence of archaeological resources. HRG data acquisition instrumentation used during surveys could add noise to the underwater environment. The types of equipment that may be used during these surveys are described in **Tables 2-4** and **2-5**. Acoustic information presented is representative of the types of equipment that may be used during characterization and site surveys, for which sound characteristics are known from field measurements at various distances from the source; these measurements were then back calculated to 1 meter (m) to estimate the source levels shown in **Table 2-5** (Crocker and Fratantonio 2016). This information is based on the highest reported power settings and source levels, but the actual equipment and settings used could have frequencies and source levels that differ from those indicated. The line spacing for HRG surveys would vary depending on the data collection requirements of the different HRG survey types, as shown in **Table 2-4**. The HRG survey equipment has numerous configurations (e.g., towed, pole mounted, hull mounted) but is typically deployed as a single source element, unlike other geophysical survey operations (e.g., oil and gas deep penetrating seismic exploration and mid-frequency active sonar military exercises), which use source arrays with multiple units or elements operating in unison. More information on the technical specifications of the representative sources presented here can be found in Crocker and Fratantonio (2016).

Table 2-4. High-resolution geophysical survey equipment and methods

Equipment Type	Data Collection and/or Survey Types	Description of the Equipment	Line Spacing
Bathymetry/ depth sounder (multibeam echosounder)	Bathymetric charting	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 water depths expected in the survey area. This Draft EA assumes the use of multibeam bathymetry systems, which may be more appropriate than other tools for characterizing WEAs containing complex bathymetric features or sensitive benthic habitats, such as hardbottom areas.	The lessee would likely use a multibeam echosounder at a line spacing appropriate to the range of depths expected in the survey area.
Magnetometer	Collection of geophysical data for shallow hazards and archaeological resources assessments	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 and anticipated to be no more than approximately 6 m above the seafloor.	For the collection of geophysical data for shallow hazards assessments (including magnetometer, side-scan sonar, and sub-bottom profiler systems), BOEM recommends survey at a 150-m line spacing. For the collection of geophysical data for archaeological resources assessments (including magnetometers, side-scan sonar, and all sub-bottom profiler systems), BOEM recommends survey at a 30-m line spacing.
Side-scan sonar	Collection of geophysical data for shallow hazards and archaeological resources assessments	This survey technique is used to evaluate surface sediments, seafloor morphology, and potential surface obstructions (MMS 2007b). 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 the lessee would use a digital dual-frequency side-scan sonar system with 300 to 500 kHz frequency ranges or greater to record continuous planimetric images of the seafloor.	
Shallow and medium (seismic) penetration sub-bottom profilers	Collection of geophysical data for shallow hazards and archaeological resources assessments and to characterize subsurface sediments	Sources used to collect these data consist of amplitude-frequency modulated systems (i.e., CHIRPs), electromagnetic transducers (e.g., boomers, bubble guns), and electrode sparkers. Typically, a high-resolution 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 that may be employed is a medium-penetration system, such as a boomer, bubble pulser, or impulse type system. Sub-bottom profilers are capable of penetrating sediment depth ranges of 3 m to greater than 100 m, depending on frequency and bottom composition.	

BOEM = Bureau of Ocean Energy Management; CHIRP = Compressed High-Intensity Radiated Pulse; EA = Environmental Assessment; kHz = kilohertz; m = meter; MMS = Marine Minerals Service; WEA = Wind Energy Area.

Table 2-5. High-resolution geophysical survey equipment and their acoustic characteristics

HRG Equipment Categories	SL PK (dB re 1 µPa m)	SL SPL (dB re 1 µPa m)	SL SEL (dB re 1 µPa m)	Main Pulse Frequency (kHz)	Pulse Duration (seconds)	PPS	Beamwidth (degrees)
Medium-penetration SBP							
Boomers (proxy: AA251 Boomer Plate)	216	207	176	4.3	0.0008	1	Omni
Sparkers (proxy: AA Dura-spark)	225	214	188	2.9	0.0022	6	Omni
Bubble guns	204	198	173	1.1	0.0033	8	Omni
Shallow-penetration, non-parametric SBP (CHIRPs)							
SBP (proxy: EdgeTech 512i)	185	180	159	6.3	0.0087	8	80
SBP (proxy: Knudsen 3202)	214	209	193	3.3	0.0217	4	83
Parametric SBP							
Innomar, SES-2000 Medium-100	N/A	232	N/A	85	0.0035	40	5
Echosounders							
Reson Seabat 7111 multibeam echosounder	228	224	185	100	0.00015	20	160
Reson Seabat T20P multibeam echosounder	223	220	184	> 200	0.000254	50	150
Echotrac CV100 single-beam echosounder	197	194	163	> 200	0.000711	20	7
Side-scan sonar							
Klein 3900 side-scan sonar	226	220	179	> 200	0.000084	unreported	1.3
USBL positioning							
AA, Easytrak Nexus 2	193	192	N/A	18	0.0010	2	150
iXblue, IxSea GAPS Beacon System	N/A	188	N/A	8	0.0010	1	Omni

Source: Highest reported source levels (estimated at a distance of 1 m from the source) reported in Crocker and Fratantonio (2016) or manufacturer specifications for equipment categories that may be used for offshore wind site characterization surveys and modified as necessary based on manufacturer specifications or standard operating configurations.
µPa = micropascal; CHIRP = Compressed High -Intensity Radiated Pulse; dB = decibels; HRG = high-resolution geophysical; N/A = not applicable; PK = Zero-to-peak sound pressure level; PPS = pulses per second; re = referenced to; SBP = sub-bottom profiler; SEL = sound exposure level; SL = source level; SPL = Root-mean-square sound pressure level; USBL = ultra-short baseline.

BOEM assumes that, during site characterization, a lessee would survey potential offshore export cable routes (for connecting future wind turbines to an onshore power substation) from the WEA to shore using HRG survey methods. BOEM assumes that the HRG survey grids for a proposed offshore export cable route to shore would likely occur over a 1,000-m-wide corridor centered on the potential offshore export cable location to allow for anticipated physical disturbances and movement of the proposed cable, if necessary. Because it is not yet possible to predict precisely where an onshore electrical substation may ultimately be installed or the route that any potential future export cable would take across the seafloor from the WEA to shore, this Draft EA used direct routes from the middle (centroid) of each WEA to hypothetical potential interconnection points onshore in Delaware and Virginia. The hypothetical points were selected based on proximity from onshore points of interconnection to each WEA to conservatively approximate the level of surveys that may be conducted and number of samples that would be collected to characterize an offshore export cable route. The hypothetical points of interconnection used to approximate the level of surveys for the WEAs in no way represents proposed export cable routes.

Increased vessel presence and traffic during HRG surveys could result in several impact-producing factors (IPFs), including noise, air emissions, routine vessel discharges, and lighting from vessels.

2.4.2 Geotechnical Surveys

Geotechnical surveys are performed to assess the suitability of shallow sediments to support a structure foundation (i.e., gather information to determine whether the seabed can support foundation structures) or offshore export cables under operational and environmental conditions that could potentially be encountered (including extreme weather events), as well as to document the sediment characteristics necessary for design and installation of all structures and cables. Samples for geotechnical evaluation are typically collected using a combination of boring methods and in-situ methods taken from a survey vessel or drilling vessel. Likely methods to obtain samples to analyze physical and chemical properties of surface sediments are described in **Table 2-6**. These methods may result in bottom disturbance as a result of physical seafloor sampling.

BOEM Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information (BOEM 2024) require high frequency sub-bottom profiler data and medium penetration seismic surveys. Medium penetration seismic systems, such as a boomer, bubble pulser, or other low frequency system, can be used to provide information on sedimentary structure that exceeds the depth limitations of Compressed High-Intensity Radiated Pulse (CHIRP) systems. BOEM guidance also recommends collection of sedimentary structure data 10 m beyond the depth of disturbance, which may be conducted using. sub-bottom profiler systems. As noted in the BOEM guidelines, NMFS has technical guidance for understanding how some types of survey equipment may impact marine mammals. The lessee should be aware of how the choice in equipment may impact marine mammals and require a permit from the NMFS.

Geotechnical/benthic sampling of the WEAs would require a sample at every potential wind turbine location (which would only occur in the portion of the WEA where structural placement is allowed) and one sample per kilometer of offshore export cable corridor. The amount of effort and number of vessel trips required to collect the geotechnical samples varies greatly by the type of technology used to retrieve the sample (**Table 2-6**). The area of seabed disturbed by individual sampling events (e.g., collection of a core or grab sample) is estimated to range from 1 to 10 square meters (m^2)(BOEM 2014a; Fugro Marine GeoServices Inc. 2017). Some vessels require anchoring for brief periods using small anchors; however, approximately 50% of deployments for this sampling work could involve a boat having dynamic positioning capability (i.e., no seafloor anchoring impacts) (BOEM 2014a). There are residual risks of encountering Munitions and Explosives of Concern (MEC)/Unexploded Ordnance (UXO) during surveying, and in the event a MEC/UXO is encountered, lessees should follow the National Guidance for Responding to Munitions and Explosives of Concern in Federal Waters.[3]

As with HRG surveys, increased vessel presence and traffic during geotechnical surveys may result in several IPFs including noise, air emissions, routine vessel discharges, and lighting from vessels. Additionally, bottom disturbance may occur as a result of geotechnical surveys due to physical sampling methods.

Table 2-6. Geotechnical/benthic sampling survey methods and equipment

Survey Method	Use	Description of the Equipment and Methods
Bottom-sampling devices	Penetrating depths from a few centimeters to several meters	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 allows the best possible sediment sample to be obtained by avoiding disturbance of the sample (MMS 2007b). Shallow-bottom coring employs a rotary drill that penetrates through several feet of consolidated rock. Drilling produces low-intensity, low-frequency sound through the drill string. The above sampling methods do not use high-energy sound sources (Continental Shelf Associates Inc. 2004; MMS 2007a).
Vibracores	Obtaining samples of unconsolidated sediment; may, in some cases, also be used to gather information to inform the archaeological interpretation of features identified through the HRG survey (BOEM 2020a)	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 6 m long with 8 cm diameters are obtained, although some devices have been modified to obtain samples up to 12 m long (MMS 2007a; USACE 1987).
Deep borings	Sampling and characterizing the geological properties of sediments at the maximum expected depths of the structure foundations (MMS 2007a)	A drill rig is used to obtain deep borings. The drill rig is mounted on a jack-up barge supported by four "spuds" that are lowered to the seafloor. Geologic borings can generally reach depths of 30–61 m within a few days (based on weather conditions). The acoustic levels from deep borings can be expected to be in the low-frequency bands and below the 160 dB threshold established by NMFS to protect marine mammals (Erbe and McPherson 2017).
CPT	Supplement or use in place of deep borings (BOEM 2024)	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 8 cm in diameter, with connecting rods less than 15 cm in diameter.

BOEM = Bureau of Ocean Energy Management; cm = centimeter; CPT = cone penetration test; dB = decibels; HRG = high-resolution geophysical; m = meter; MMS = Marine Minerals Service; NMFS = National Marine Fisheries Service; USACE = U.S. Army Corps of Engineers.

[3] Proposed "National Guidance for Industry on Responding to Munitions and Explosives of Concern in U.S. Federal Waters" was published by the U.S. Committee on the Marine Transportation System on August 25, 2023 (https://www.federalregister.gov/documents/2023/08/25/2023-18381/proposed-national-guidance-for-industry-on-responding-to-munitions-and-explosives-of-concern-in-us).

2.4.3 Biological Surveys

Biological surveys are necessary to characterize the biological resources that could be affected by the proposed activity or could affect activities in the proposed plan. Benthic habitat, avian, bat, and marine fauna surveys are all expected as part of the Proposed Action. Biological survey activities associated with the Proposed Action are described in **Table 2-7**. For biological surveys, BOEM assumes that all vessels associated with the Proposed Action would be required to abide by the SOCs (**Section 4**). NMFS may require additional measures from the lessee to comply with the MMPA and/or the Endangered Species Act (ESA).

Increased vessel presence and traffic during biological surveys may result in several IPFs, including noise, air emissions, routine vessel discharges, and lighting from vessels. Some biological surveys may be conducted from an aircraft (e.g., avian and bat surveys) and, if conducted, may result in aircraft noise, lighting, and emissions. Additionally, bottom disturbance and marine faunal mortality may occur as a result of benthic habitat and fisheries surveys due to physical sampling methods.

Table 2-7. Biological survey types and methods

Biological Survey Type	Survey Guidelines	Survey Method	Timing
Benthic habitat	Guidelines for Providing Benthic Habitat Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585, Subpart F. www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/BOEM-Renewable-Benthic-Habitat-Guidelines.pdf	Bottom sediment/fauna sampling and underwater imagery/sediment profile imaging (sampling methods described above under geotechnical surveys)	Concurrent with geotechnical/benthic sampling
Avian	BOEM. 2020b. Guidelines for Providing Avian Habitat Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585. www.boem.gov/sites/default/files/documents/newsroom/Avian%20Survey%20Guidelines.pdf	Visual surveys from a boat	10 OCS blocks per day (Thaxter and Burton 2009) monthly for 2 to 3 years
		Plane-based surveys	2 days per month for 2 to 3 years
Bats	None	Ultrasonic detectors installed on survey vessels being used for other biological surveys	Monthly for 3 months per year between March and November
Marine fauna (marine mammals, fish, and sea turtles)	BOEM. 2019b. Guidelines for Providing Information on Fisheries for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585. www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/BOEM-Fishery-Guidelines.pdf BOEM. 2019c. Guidelines for Providing Information on Marine Mammals and Sea Turtles for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585. www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/BOEM-Marine-Mammals-and-Sea-Turtles-Guidelines.pdf	Plane-based and/or vessel surveys—may be concurrent with other biological surveys, but would not be concurrent with any geophysical or geotechnical survey work	2 years of survey to cover spatial, temporal, and inter-annual variance in the area of potential effect

Biological Survey Type	Survey Guidelines	Survey Method	Timing
General guidelines	BOEM. 2019. Survey Guidelines For Renewable Energy Development https://www.boem.gov/renewable-energy/survey-guidelines-renewable-energy-development BOEM. 2016a. Mid Atlantic Regional Ocean Action Plan https://www.boem.gov/sites/default/files/environmental-stewardship/Mid-Atlantic-Regional-Planning-Body/Mid-Atlantic-Regional-Ocean-Action-Plan.pdf BOEM 2024. U.S. Department of the Interior. Bureau of Ocean Energy Management, Renewable Energy Programs, December 28, 2023 (published January 2, 2024). Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585. https://www.boem.gov/sites/default/files/documents/about-boem/Updated%20Renewable%20Energy%20Geohazard%20Guidelines%202023_508c.pdf	---	---

BOEM = Bureau of Ocean Energy Management; OCS = Outer Continental Shelf.

2.4.4 Meteorological Buoy – Installation, Operation, and Decommissioning

Installation, operation and maintenance, and decommissioning of met buoys for characterizing wind conditions are part of the assumptions/scenario for the Proposed Action. Met buoys are anchored to the seafloor at fixed locations and regularly collect observations from many different atmospheric and oceanographic sensors. This Draft EA assumes that a maximum of two buoys per lease would be installed; thus, with an assumed four leases within the three WEAs, a total of eight buoys are considered (two met buoys per lease area). The choice of buoy type used usually depends on its intended installation location and measurement requirements. For example, a smaller buoy in shallow coastal waters may be moored using an all-chain mooring. 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. The other relevant lease issuance EAs listed in **Table 2-1** provide evaluations of various met buoy schematics and met buoy and anchor systems, including hull type, height, and anchoring methods. These EAs also describe activities related to installation, operation and maintenance, and decommissioning of the met buoys. Buoy types that are typically deployed are also described by the National Data Buoy Center (NDBC 2012).

Buoys are towed or carried aboard a vessel to the installation location and either lowered to the ocean surface from the deck of the vessel or placed over the final location and the mooring anchor is dropped. Based on previous proposals, anchors for boat-shaped or discus-shaped buoys would weigh about 2,721 to 4,536 kilograms (kg), with a footprint of about 0.5 m^2 and an anchor chain sweep of about 34,398 m^2 (BOEM 2014a; Fugro Marine GeoServices Inc. 2017). Transport and installation vessel anchoring for 1 day is anticipated for these types of buoys. For spar-type buoys, installation would occur in two phases. Phase one would occur over 1 day, and the clump anchor would be transported and deployed to the seabed. In phase two, which would take place over 2 days, the spar-buoy would be similarly transported and then crane lifted into the water. Divers would secure it to the clump anchor (which weighs a minimum of 100 tons). Previous proposals have indicated that the maximum area of disturbance related to deployment of a spar-buoy occurs during anchor deployment/removal, resulting in a maximum area of disturbance of 118 m^2 of seafloor between its clump anchor and mooring chain (BOEM 2014a).

On-site inspections and preventative maintenance (i.e., marine fouling, wear, or lens cleaning) are expected to occur on a monthly or quarterly basis for met buoys. 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.

Decommissioning is basically the reverse of the installation process. Equipment recovery would be performed with the support of a vessel(s) equivalent in size and capability to that used for installation. For small buoys, a crane-lifting hook would be secured to the buoy. A water/air pump system would de-ballast the buoy, causing it to tip 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. Buoy decommissioning is expected to be completed within 1 to 2 days depending on buoy type.

Decommissioning and site clearance activities are also a part of decommissioning obligations and requirements pursuant to 30 CFR 285 Subpart I—Decommissioning. A lessee must provide evidence that the area used for site assessment facilities (i.e., met buoys) has been returned to its original state within 60 days following removal of the facilities. The lessee must remove any trash or bottom debris introduced as a result of operations and document that the lease area is clear; such evidence may consist of one or more of the following: photographic bottom survey, high-resolution side-scan survey, or sector-scanning sonar survey.

IPFs associated with met buoy installation operation and maintenance, and decommissioning (including site clearance) may include vessel traffic, noise, lighting, air emissions, and routine vessel discharges. Bottom disturbance and habitat degradation may also occur as a result of met buoy anchoring and installation. The presence of the buoy may act as a fish aggregating device attracting fish and other species (e.g., birds) to the buoy location. Entanglement in buoy or anchor components is a possible IPF associated with this phase of the Proposed Action.

2.4.5 Non-Routine Events

Reasonably foreseeable non-routine events, low-probability events, and hazards that could occur during site characterization and site assessment related activities include the following: (1) severe storms, such as hurricanes and extratropical cyclones; (2) allisions and collisions between the site assessment structures or associated vessels and other vessels or marine life; (3) spills from collisions or fuel spills resulting from generator refueling; and (4) recovery of lost survey equipment.

Impacts on the Proposed Action from storms, allisions and collisions, and spills have been previously described and analyzed in previous EAs and the Atlantic G&G Final PEIS (**Table 2-1**). The 2014 Programmatic EIS for Atlantic OCS Proposed Geological and Geophysical Activities - Mid-Atlantic and South Atlantic Planning Areas (**Table 2-1**) and other previous documents specifically address the Central Atlantic area (Delaware to North Carolina), and the assessment of potential impacts presented in those documents applies equally to the Proposed Action as the risks of these events are not materially different from those assessed in previous documents. Accordingly, the potential impacts from non-routine events are described in those EAs and are briefly described below but not analyzed in detail in **Section 4**. However, recovery of lost survey equipment is a newly identified non-routine event and is carried forward for analysis in this Draft EA.

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. The Atlantic Ocean hurricane season extends from June 1 to November 30, with a peak in September when hurricanes would be most likely to impact the WEAs at some time during the Proposed Action. Storms could contribute to an increased likelihood of allisions and collisions that could result in a spill. However, the storm would cause the spill and its effects to dissipate faster, vessel traffic is likely to be significantly reduced in the event of an impending storm, and surveys related to the Proposed Action would be postponed until after the storm had passed. Although storms have the potential to impact met buoys, the structures are designed to withstand storm conditions. Though unlikely, structural failure of a met buoy could result in a temporary hazard to navigation.

Allisions and Collisions

An allision occurs when a moving object (i.e., a vessel) strikes a stationary object (e.g., met buoy); a collision occurs when two moving objects strike each other. A met buoy in the WEA could pose a risk to vessel navigation. An allision between a ship and a met buoy could result in the damage or loss of the buoy and/or the vessel, as well as loss of life and spillage of petroleum product. Although considered unlikely, vessels associated with site characterization and site assessment activities could collide with other vessels, resulting in damages, petroleum product spills, or capsizing. Risk of allisions and collisions may be reduced through compliance with USCG Navigation Rules and Regulations, use of navigational aids (i.e. Aids to Navigation [ATON], bridge equipment, charts, informational notices and publications, etc.), safety fairways, and Traffic Separation Schemes (TSSs) for vessels transiting to and from ports primarily in Delaware, Maryland, and Virginia. BOEM anticipates that aerial surveys (if necessary) would not be conducted during periods of storm activity because the reduced visibility conditions would not meet visibility requirements for conducting the surveys; flying at low elevations would pose a safety risk during storms and times of low visibility.

Collisions between vessels and allisions between vessels and met buoys are considered unlikely because vessel traffic is controlled by multiple routing measures, such as safety fairways, TSSs, and anchorages. Higher traffic areas were excluded from the WEAs. BOEM requires the lessee to submit a Private Aid to Navigation (PATON) application with the USCG for the met buoy. Risk of allisions with met buoys would be further reduced by USCG-approved marking and lighting on the met buoys. The lessee will be responsible for establishment, operation, maintenance, and discontinuance of the PATON.

Spills

A spill of petroleum product could occur as a result of hull damage from allisions with a met buoy, collisions between vessels, accidents during the maintenance or transfer of offshore equipment and/or crew, or natural events (i.e., strong waves or storms). From 2000 to 2009, the average spill size for vessels other than tank ships and tank barges was 88 gallons (USCG 2011); should a spill from a vessel associated with the Proposed Action occur, BOEM anticipates that the volume would be similar.

Diesel fuel is lighter than water and may float on the water's surface or be dispersed into the water column by waves. Diesel would be expected to dissipate very rapidly, evaporate, and biodegrade within a few days (MMS 2007a). The National Oceanic and Atmospheric Administration's (NOAA's) Automated Data Inquiry for Oil Spills (ADIOS; an oil weathering model) was used to predict dissipation of a maximum spill of 2,500 barrels, a spill far greater than what is assumed as a non-routine event during the Proposed Action. Results of the modelling analysis showed that dissipation of spilled diesel fuel is rapid. The amount of time it took to reach diesel fuel concentrations of less than 0.05% varied between 0.5 and 2.5 days, depending on ambient wind (Tetra Tech Inc. 2015), suggesting that 88 gallons would reach similar concentrations much faster and limit the environmental impact of such a spill. Based on the size of the spill, it would be expected to dissipate very rapidly and would then evaporate and biodegrade within a day or two (at most), limiting the potential impacts to a localized area for a short duration.

Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills, and most equipment on the met buoys would be powered by batteries charged by small wind turbines and solar panels. BOEM expects that each of the vessels involved with site characterization and site assessment activities would minimize the potential for a release of oils and/or chemicals in accordance with 33 CFR Part 151, 33 CFR Part 154, and 33 CFR Part 155, which contain guidelines for implementation and enforcement of vessel response plans, facility response plans, and shipboard oil pollution emergency plans.

Recovery of Lost Survey Equipment

Equipment used during site characterization and site assessment activities (e.g., towed HRG survey equipment, cone penetration test [CPT] components, grab sampler, buoys, lines, cables) could be accidentally lost during survey operations. Additionally, it is possible (although unlikely) that a met buoy could disconnect from the clump anchor. In the event of lost equipment, recovery operations may be undertaken to retrieve the equipment. Recovery of lost survey equipment is a newly identified non-routine event from previous EAs (**Table 2-1**) and therefore is carried forward for analysis in this Draft EA.

Recovery operations may be performed in a variety of ways depending on the type of equipment lost. A commonly used method for retrieval of lost equipment that is on the seafloor is through dragging grapnel lines (e.g., hooks, trawls). A single vessel deploys a grapnel line to the seafloor and drags it along the bottom until it catches the lost equipment, which is then brought to the surface for recovery. This process can result in significant bottom disturbances as it requires dragging the grapnel line along the bottom until it hooks the lost equipment, which may require multiple passes in a given area. In addition to dragging a grapnel line along the bottom, after the line catches the lost equipment, it will drag all the components along the seafloor until recovery.

Marine debris, such as lost survey equipment, that is not able to be retrieved because it is either small or buoyant enough to be carried away by currents or is completely or partially embedded in the seafloor (for example, a broken vibracore rod) could create a potential hazard for bottom-tending fishing gear or cause additional bottom disturbance. A broken vibracore rod that cannot be retrieved may need to be cut and capped 1 to 2 m below the seafloor. For the recovery of marine debris, BOEM and/or BSEE will work with the lessee/operator to develop a recovery plan as described in the NMFS Programmatic ESA consultation for data collection activities (Anderson 2021). Selection of a mitigation strategy would depend on the nature of the lost equipment, and further consultation may be necessary.

IPFs associated with recovery of marine debris such as lost survey equipment may include vessel traffic, noise, lighting, air emissions, and routine vessel discharges from a single vessel. Recovery operations may also cause bottom disturbance and habitat degradation.

2.5 Impact-Producing Factors

This Draft EA analyzes the effects of routine activities associated with lease and grant issuance, site characterization activities (i.e., biological, geological, geotechnical, and archaeological surveys of the WEAs as shown in **Table 2-3**), and site assessment activities (i.e., met buoy deployment, operation, and decommissioning) within the WEAs and within potential easements associated with offshore export cable corridors. It does not consider construction and operation of any commercial wind power facilities on a lease or grant in the identified WEAs, which would be evaluated separately if a lessee submits a COP.

BOEM completed a study of IPFs on the North Atlantic OCS to consider in an offshore wind development cumulative impacts scenario (Avanti Corporation and Industrial Economics Inc. 2019). An IPF is the outcome or result of any proposed activities with the potential to positively or negatively affect physical, biological, cultural, and/or socioeconomic resources. IPFs associated with the various activities in the Proposed Action that could affect resources include the following:

Noise	Vessel Traffic
Air Emissions	Routine Vessel Discharges
Lighting	Bottom Disturbance/Anchoring
Habitat Degradation	Entanglement

The timing of lease issuance, as well as weather and sea conditions, would be the primary factors influencing the timing of site characterization surveys and site assessment activities. BOEM could issue leases in mid- to late-2024 and continue through 2025. Lessees have up to a 1-year preliminary term to begin site characterization surveys and submit a Site Assessment Plan (SAP).

Pursuant to 30 CFR §585.605. the Lessee must provide the data from the physical characterization and baseline environmental surveys supporting the SAP which are reviewed by BOEM to identify the presence of anthropogenic hazards such as MEC/UXO, archaeological resources and biologically sensitive habitats. Geophysical surveys are conducted, and the results reviewed prior to any bottom disturbing surveys (e.g., geotechnical surveys). The review of the site characterization information results in conditions of SAP approval to avoid or mitigate potential impacts to identified resources and hazards.

Lessees must receive BOEM approval of the SAP before proceeding with approved activities (e.g., met buoy deployment). Lessees then have up to 5 years after SAP approval to perform additional site characterization and site assessment activities before they must submit a COP (30 CFR § 585.235(a)(1-2)).[4]

[4] BOEM's proposed Renewable Energy Modernization Rule would eliminate the requirement for lessees to submit a SAP that includes the installation and operations of met buoys to BOEM for approval.

3 Environmental Consequences

Each resource section of this chapter includes a summary description of the affected resource and an analysis of the potential environmental consequences of site assessment and site characterization activities under each alternative for that particular resource. The impacts of Alternative A, which includes ongoing and planned activities, are described for each resource and are used to determine the incremental impact of Alternative B on the resource. Cumulative impacts include the incremental impact of Alternative B when added to the past, present, and reasonably foreseeable activities.

Appendix D includes a list of the ongoing and planned actions and IPFs that BOEM has identified as potentially contributing to cumulative impacts when combined with impacts from the Proposed Action over the geography and time scale described in **Section 3.3**. Reasonably foreseeable planned actions include eight types of actions: (1) other wind energy development activities such as site characterization surveys; site assessment activities; and construction, operation, and decommissioning of wind energy facilities that could occur on existing leases; (2) hydrokinetic projects; (3) undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); (4) marine minerals use and ocean dredged material disposal; (5) military use; (6) marine transportation; (7) fisheries use and management; and (8) global climate change. As indicated in **Section 2**, issuance of a lease only grants the lessee the exclusive right to submit to BOEM a SAP and COP proposing development of the leasehold; the lease does not, by itself, authorize any activity within the lease area. Therefore, the analysis in this EA does not consider development of the Central Atlantic WEAs. However, the No Action Alternative does consider current approved, proposed, and potential wind energy projects across existing leases.[5]

3.1 Geographic Analysis Area

BOEM used a localized geographic scope to evaluate impacts from planned actions for resources that are fixed in nature (i.e., their location is stationary, such as benthic and archaeological resources) or for resources where impacts from the Proposed Action would only occur in waters in and directly around the Central Atlantic WEAs (e.g., water quality). This analysis includes potential activities that are anticipated to occur on the Atlantic OCS offshore Delaware to Virginia, as well as activities that may take place in state waters (the Central Atlantic area) (**Figure 1-1**). However, the geographic boundaries for the analysis for marine mammals, sea turtles, fish/fishing, and birds include the entire Central Atlantic and some waters offshore Delaware to the north and North Carolina to the south given their highly mobile and, in some cases, migratory nature (**Appendix D, Figure D-1**). BOEM has not defined onshore areas from which the site characterization activities would be visible as part of the analysis area because BOEM has concluded that the equipment and vessels performing these activities would be indistinguishable from existing lighted vessel traffic from an observer onshore. In addition, there is no indication that the issuance of a lease or grant of an RUE or ROW and subsequent site characterization

[5] Approved projects are those projects for which BOEM has issued a COP approval. Proposed projects are those projects for which a COP has been submitted to BOEM. Potential projects are leases or portions of leases for which a COP has not been submitted to BOEM.

would involve expansion of existing port infrastructure. Therefore, onshore staging activities are not considered as part of the cultural, historical, and archaeological resources analysis area.

3.2 Impact Level Determinations

This EA uses a four-level classification scheme (negligible, minor, moderate, and major) to characterize the environmental impacts predicted if the Proposed Action or the No Action Alternative is implemented. Definitions of impacts are presented in two separate groups: (1) biological and physical resources and (2) socioeconomic resources. Impact level definitions used in this EA are described in **Table 3-1**.

The impact level definitions below were originally developed for BOEM's PEIS for Alternative Energy Development (MMS 2007b), were used in previous lease issuance EAs (**Table 2-1**), and are used in this EA to provide consistency in BOEM's discussion of impacts.

Table 3-1. Definitions of impact determinations used in this Environmental Assessment

Impact Determination	Definition for Biological and Physical Resources	Definition for Socioeconomic Resources
Negligible	Little to no effect or no measurable impacts.	Little to no effect or no measurable impacts.
Minor	Most impacts on the affected resource could be avoided with mitigation. Impacts would not disrupt the normal or routine functions of the affected resource. If impacts occur, the affected resource would recover completely without any mitigation once the impacting agent is eliminated.	Adverse impacts on the affected activity or community could be avoided with 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 resource are unavoidable. Mitigation would reduce impacts substantially during the life of the Proposed Action. The viability of the affected resource is not threatened, although some impacts may be irreversible, or the affected resource would recover completely if mitigation is applied during the life of the Proposed Action or remedial action is taken once the impacting agent is eliminated.	Impacts on the affected activity or community are unavoidable. Mitigation would reduce impacts substantially during the life of the Proposed Action. The affected activity or community would have to adjust somewhat to account for disruptions due to impacts of the Proposed Action, or, once the impacting agent is eliminated, the affected activity or community would return to a condition with no measurable effects if remedial action is taken.

Impact Determination	Definition for Biological and Physical Resources	Definition for Socioeconomic Resources
Major	Impacts on the affected resource are unavoidable. Mitigation would reduce impacts somewhat during the life of the Proposed Action. The viability of the affected resource may be threatened, and the affected resource would not fully recover, or the resource may retain measurable effects indefinitely even if mitigation is applied during the life of the Proposed Action or remedial action is taken once the impacting agent is eliminated.	Impacts on the affected activity or community are unavoidable. Mitigation would reduce impacts somewhat during the life of the Proposed Action. 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.

In order to comply with the page limits of Section 1501.5 of the CEQ implementing regulations, BOEM has focused the main body of this EA on the impacts for resources of most concern based on comments received during the public scoping period and the potential for greater than negligible impacts, and has moved to **Appendix B** the analysis of other resources. **Appendix B** includes resources eliminated from detailed consideration in this EA (i.e., bats; bathymetry, geology, and sediments; birds; coastal habitats; coastal infrastructure; demographics and employment; environmental justice; physical oceanography, visual resources; and water quality) and air quality (air emissions estimates are presented in **Appendix C**); cultural, historical, and archaeological resources; and recreation and tourism.

3.3 Alternative A – No Action Alternative and Affected Environment

The No Action Alternative sections include a description of the baseline conditions of each resource, as well as a description of how the affected environment or baseline for each resource may change, evolve, or shift (i.e., the trajectory of the resource) absent the Proposed Action (Alternative B).

3.3.1 Benthic Resources

Benthic resources are described in the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia EA (BOEM 2012), which is incorporated by reference (**Table 2-1**).

The continental shelf is characterized by a seabed morphology consisting of relatively flat, migrating sand waves and ripples with occasional larger sand ridges. Surficial sediment types are generally sand of varying coarseness with mixtures of silt or gravel (Guida et al. 2017). Sand ridges provide a distinct habitat for adults, settled juveniles, and larvae for a number of fish species, indicating that they have a distinct influence on fish abundance and assemblages (see **Section 3.3.3** for additional information). **Section 3.3.3** also includes a discussion of impacts on Essential Fish Habitat (EFH).

Various benthic fauna are found in the continental shelf habitat, ranging in size from microscopic to larger macrofauna. Common macrofauna of the inner continental shelf include species from several taxa, including echinoderms (e.g., sea stars, sea urchins, sand dollars), cnidarians (e.g., sea anemones, soft corals), mollusks (e.g., bivalves, cephalopods, gastropods), bryozoans, sponges, amphipods, and crustaceans (BOEM 2012).

Artificial reefs are human-made underwater structures that are developed intentionally or from remnants of objects built for other purposes, such as shipwrecks. Delaware has 14 artificial reefs in the Delaware Bay and off the Atlantic coast, 5 of which are in the Atlantic Ocean (Delaware DNREC Division of Fish and Wildlife, 2023). Maryland has 23 artificial reefs located inshore in the Chesapeake Bay and its tributaries and 11 artificial reefs located offshore in the Atlantic Ocean in state or Federal waters (Maryland DNR 2016). Virginia has 23 artificial reefs with 18 located inshore in the Chesapeake Bay and its tributaries and 5 located offshore in the Atlantic Ocean in state or Federal waters (Virginia Marine Resources Commission n.d.).

Macroalgae, seagrasses, and freshwater and tidal macrophytes (i.e., SAV) provide food and habitat for many different species, and seagrasses are protected under a number of state and Federal statutes. The dominant seagrass in the region is eelgrass, which is typically found in water depths from 1 to 8 m, well outside of the depth range of the WEAs and therefore are not expected to be present in the WEAs but could be present in shallow waters along potential transmission cable corridors (BOEM 2016). SAV has also been identified as Habitat Areas of Particular Concern (HAPCs) for both juvenile and adult summer flounder (also known as fluke) (**Sections 3.3.3** and **3.4.3**).

Benthic resources are subject to pressure from ongoing activities and conditions, especially climate change, commercial fishing using bottom-tending gear (e.g., dredges, bottom trawls, traps/pots), and sediment dredging; these activities are anticipated to continue for the foreseeable future and could possibly impact the habitat, abundance, diversity, community composition, and percent cover of benthic fauna and flora. Additional activities that disturb benthic resources include dredging for navigation and military uses (Hale et al. 2017). Dredging for navigation results in localized short-term impacts on benthic resources, and these areas are expected to recover quickly from disturbance (Avanti Corporation and Industrial Economics Inc. 2019).

Climate change is expected to continue to contribute to the gradual warming of ocean waters, which can influence distributions of benthic species and alter ecological relationships (Avanti Corporation and Industrial Economics Inc. 2019). Warmer water may influence invertebrate migration and may make them more vulnerable to disease (Brothers et al. 2016; Hoegh-Guldberg and Bruno 2010). Disturbance of benthic invertebrate communities by commercial fishing activities can impact community structure and diversity and limit recovery (Avanti Corporation and Industrial Economics Inc. 2019), though this impact is less significant in sand that is strongly influenced by tidal currents and waves (Nilsson and Rosenberg 2003; Sciberras et al. 2016). Studies of the Atlantic Coast from 1990 to 2010 show endemic benthic invertebrates shifting their distribution northward in response to rising water temperatures, resulting in changes to benthic community structure (Hale et al. 2017). Temperatures are predicted to continue to rise in the region, so this trend is likely to continue, leading to changes in the distributions of some species.

Appendix D presents additional information about the ongoing and planned actions that could impact benthic resources.

Conclusion

Under the No Action Alternative, BOEM would not issue any commercial wind energy leases in the Central Atlantic WEAs, and there would be no effects on benthic resources attributable to the Proposed Action. However, benthic resources in the Central Atlantic would continue to be exposed to climate change and ongoing and planned activities over the timeframe considered in this EA (**Appendix D**).

Over the timeframe considered in this EA, local impacts on benthic resources from climate change are likely to be small, incremental, and difficult to discern from effects of other actions such as commercial fishing in this relatively short time scale (Avanti Corporation and Industrial Economics Inc. 2019).

During reasonably foreseeable offshore wind energy development on existing leases or easements (**Appendix D**), benthic resources would be impacted by anchoring/mooring activities, installation of associated undersea cables, installation of new wind turbines and offshore substation foundations, benthic habitat sampling, and geotechnical drilling and boring; these activities are expected to contribute considerable impacts across several IPFs. Offshore wind structures could attract some fish species, resulting in increased predation on benthic resources and increased recreational and commercial fishing efforts nearby (ICF Incorporated 2021). The dominant habitat type in the region is sand or soft bottom, and species that rely on this habitat would not likely experience population-level impacts (The Nature Conservancy 2010).

Considering all the IPFs together, BOEM anticipates that the overall impacts associated with ongoing and reasonably foreseeable planned actions in the geographic analysis area may result in moderate adverse impacts on benthic resources because, though the viability of the resource is not threatened, some impacts may be irreversible.

3.3.2 Commercial and Recreational Fishing

Multiple fishing grounds are located within the Central Atlantic. The diversity of fisheries results in a variety of vessels, gear types, and fishing techniques being used in the WEAs (BOEM 2021a).

Fisheries in the geographic analysis area are managed at the Federal, state, and regional level. At the Federal level, there are two councils designated by the Magnuson Fishery Conservation and Management Act of 1976 (later renamed the Magnuson-Stevens Fishery Conservation and Management Act): New England Fishery Management Council (NEFMC) for Connecticut, Massachusetts, Maine, New Hampshire, and Rhode Island; and the Mid-Atlantic Fishery Management Council (MAFMC) for Delaware, Maryland, North Carolina, New Jersey, New York, Pennsylvania, and Virginia. At the regional level, the Atlantic States Marine Fisheries Commission (ASMFC) comprises 15 Atlantic states. Species managed at the Federal level include sea scallop, Atlantic salmon, and Atlantic herring by the NEFMC and Atlantic bluefish by the MAFMC; both councils jointly manage monkfish and spiny dogfish. Species managed at the regional level include American lobster, black drum, red drum, tautog, and weakfish. Black sea bass, spiny dogfish, scup, and summer flounder are managed at both the Federal and regional levels. NOAA Fisheries has management authority for certain tunas and sharks.

NOAA Fisheries maintains landings data for commercial and recreational fisheries based on year, state, and species. Fisheries that utilize the Central Atlantic to the greatest extent include the Atlantic sea scallop, squid, summer flounder, and surfclam/ocean quahog fisheries. There are multiple recreational fishing areas within the Central Atlantic, particularly around the Chesapeake Bay and the Outer Banks.

Based on data from 2011, common species fished included the shortfin and longfin squid, Atlantic surfclam, ocean quahog, and summer flounder (Mid-Atlantic Fishery Management Council n.d.).

Generally, the activity and value of fisheries are expected to remain fairly stable during the timeframe considered in this EA (NOAA Fisheries 2021b; 2021c). Commercial fisheries and recreational fishing in the Central Atlantic are subject to pressure from ongoing activities, including regulated fishing effort, vessel traffic, other bottom-disturbing activities, and climate change. Fisheries management affects commercial fisheries and recreational fishing in the region through management of sustainable fish stocks and measures to reduce impacts on important habitat and protected species. These management plans include measures such as fishing seasons, quotas, and closed areas, which constrain how the fisheries are able to operate and adapt to change. These management actions can reduce or increase the size of available landings to commercial and recreational fisheries.

Climate change is also predicted to affect U.S. Northeast fishery species (Hare et al. 2016; NOAA Fisheries 2021b; 2021c) and may impact commercial and recreational fisheries differently; habitat may increase for some stocks and decrease for others, depending on the targeted species and ability of fishing regulations to adapt. Changing environmental and ocean conditions (currents, water temperature, etc.), increased storm magnitude or frequency, and shoreline changes can impact fish distribution, populations, and availability to commercial and recreational fisheries.

Conclusion

Under the No Action Alternative, BOEM would not issue any commercial wind energy leases in the Central Atlantic WEA, and there would be no effects on commercial and recreational fishing attributable to the Proposed Action.

However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on commercial and recreational fishing over the timeframe considered in this EA (**Appendix D**). Impacts from most ongoing activities (e.g., climate change, military use, marine transportation) are anticipated to remain largely similar to current levels over the timeframe considered; however, impacts from other wind energy development activities are anticipated to increase over the same timeframe. Ongoing actions resulting in space-use conflicts (including port utilization) with commercial and recreational fishing in the geographic analysis area primarily include marine transportation (commercial shipping) and military use.

During reasonably foreseeable offshore wind energy development on existing leases or easements (**Appendix D**), the presence of structures could lead to impacts on commercial and recreational fishing through allisions, entanglement or gear loss/damage, fish aggregation (which can be beneficial), habitat conversion, navigation hazards (including transmission cable infrastructure), and space-use conflicts (BOEM 2021c; 2021d). NOAA Fisheries estimates that activities associated with reasonably foreseeable offshore wind energy development in the geographic analysis area could affect up to 24% of total average revenue for major Mid-Atlantic commercial species in lease areas through disruption and displacement, if all lease areas considered in the NOAA assessment are developed (NOAA Fisheries 2021b; 2021c). The geographic analysis area for reasonably foreseeable offshore wind energy development in the NOAA Fisheries reports (NOAA Fisheries 2021b; 2021c) included over 20 projects and covered a larger area than considered in this EA. These effects may arise from met buoys, foundations, scour/cable protection, and transmission cable infrastructure, and some disruption effects may be unavoidable.

Considering all the IPFs together, BOEM anticipates that the overall impacts associated with ongoing and reasonably foreseeable planned actions in the geographic analysis area may result in **moderate** adverse impacts, because some commercial and recreational fishing would experience disruptions even if remedial action were taken, and others would have to adjust to account for disruptions and space-use conflicts due to impacts. Displacement impacts may also change interactions between habitats, species, and fishing fleets (NOAA Fisheries 2021b; 2021c).

3.3.3 Finfish, Invertebrates, and Essential Fish Habitat

The affected environment encompasses coastal (marine and estuarine) and demersal and pelagic habitats in the open ocean that provide habitat for over 250 fish species (Geo-Marine Inc. 2010). A general description of the affected environment for this section of the Atlantic OCS is provided in the PEIS for Alternative Energy Development (MMS 2007b). Mid-Atlantic Bight hardbottom and softbottom demersal fishes, pelagic fishes (i.e., coastal pelagic, epipelagic, and mesopelagic fishes), and ichthyoplankton are discussed in the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia EA (BOEM 2012). Many of the fish species found in the Central Atlantic are of importance due to their value as commercial and/or recreational fisheries (**Section 3.3.2**).

Fish species from the Central Atlantic listed under the ESA by NOAA Fisheries as endangered are shortnose sturgeon and Atlantic sturgeon. The Atlantic sturgeon, an anadromous species, may be found in rivers and nearshore habitats throughout the Mid-Atlantic with reproductive/spawning populations identified in the Delaware River (New Jersey and Delaware) and the James River (Virginia). More information on these ESA-listed species may be found in the biological assessment (Baker and Howson 2021).

Several managed invertebrate species occur in the Central Atlantic and are known to occur or could occur in the WEA, including longfin inshore squid, northern shortfin squid, Atlantic sea scallop, Atlantic surfclam, ocean quahog, horseshoe crab, blue crab, and American lobster. Several invertebrates—such as shrimps, other types of crabs, amphipods, gastropods, and polychaete worms—are not managed but contribute to food webs from offshore or nearshore ecosystems (Guida et al. 2017).

EFH for fish and shellfish resources of Central Atlantic WEAs were characterized using broad ecological/habitat categories: softbottom, hardbottom, and pelagic. Within each category, **Appendix E** lists the life stage composition and distribution.

The offshore analysis area primarily includes EFH for soft-bottom species (Atlantic sea scallop, ocean quahog, inshore squid, offshore squids, bluefish, hakes, skates, cod, and flatfishes) and several highly migratory species, such as tunas and sharks. HAPCs (**Figure 3-1**) offshore of Delaware, Maryland, and Virgnia include Baltimore, Wilmington, Washington, and Norfolk Canyons. Other HAPCs include a sand tiger shark pupping area in Delaware Bay; sandbar shark nursery areas in Chesapeake Bay; a tilefish nursery area near Norfolk Canyon; and summer flounder SAV nursery areas. HAPCs for summer flounder include native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH. In locations where native species have been eliminated from an area, exotic species are included in the analysis (NMFS 2021a).

Estuarine (inshore) portions of the analysis area are characterized mostly by soft-bottom sediments that support salt marshes, oyster reefs, and mussel beds, as well as stands of eelgrass and other SAV (Raposa and Schwartz 2009). Fishes segregate into these habitats by species and life stages. Managed species found in inshore waters include squids, scup, bluefish, and summer flounder (Collie et al. 2008). Many of these species are present as juveniles or subadults. Inshore habitats of the region are productive and support common prey species, such as shrimps, bay anchovy, Atlantic herring, Atlantic menhaden, butterfish, killifishes, and Atlantic silversides (Raposa and Schwartz 2009).

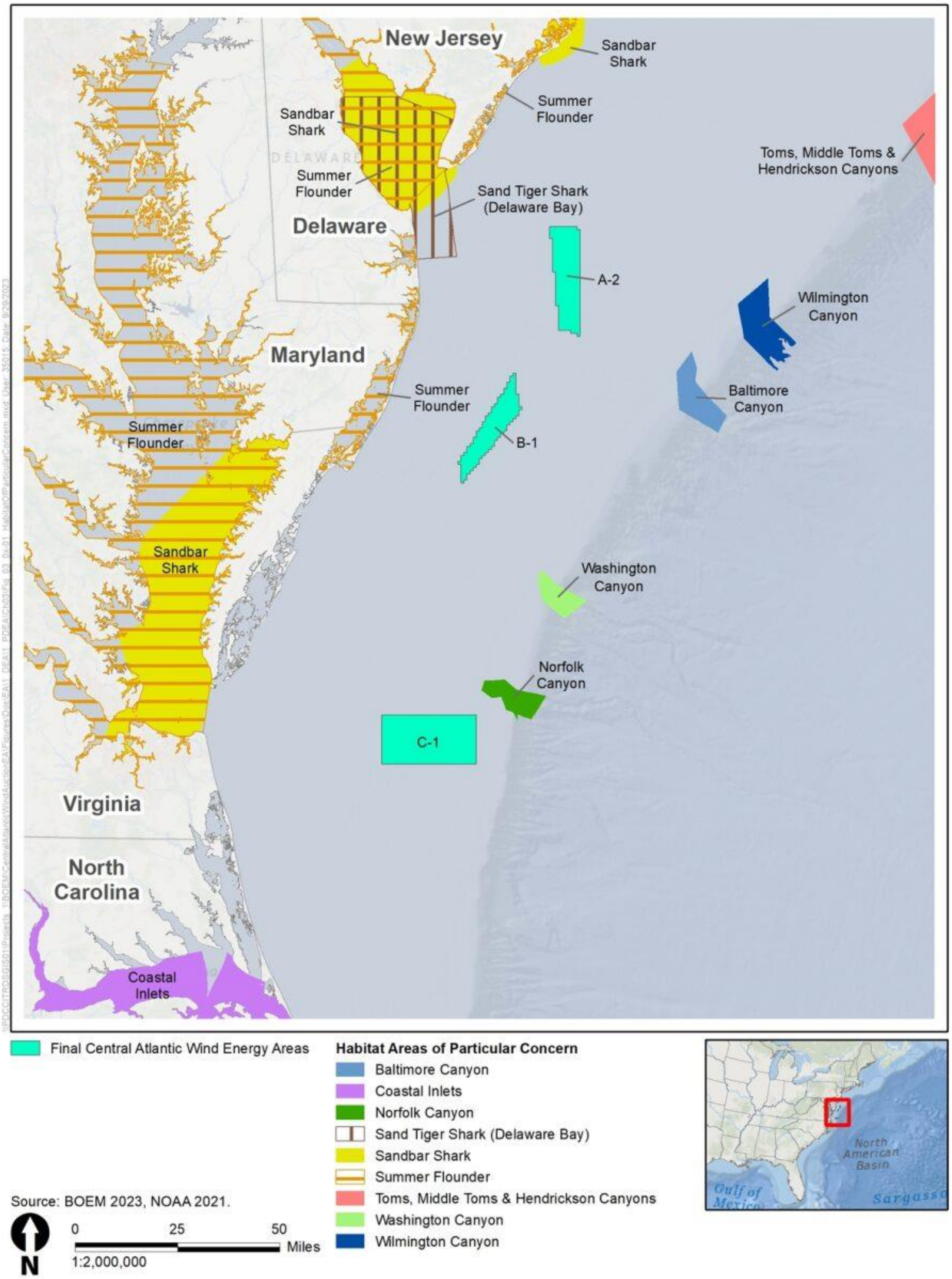

Figure 3-1. Habitat Areas of Particular Concern in the vicinity of the Central Atlantic Wind Energy Areas

Finfish, invertebrates, and EFH in the Central Atlantic are subject to pressure from ongoing activities, especially harvest, bycatch, dredging and bottom trawling, and climate change (NOAA Fisheries 2021c). As discussed in **Section 4.2.2**, climate change is also predicted to affect northeast U.S. fishery species (Hare et al. 2016); some stocks may have increased habitat, and some may see habitat reduced. Dredging for navigation, marine minerals extraction, and/or military uses, as well as commercial fishing using bottom trawls and dredge fishing methods, disturb seafloor habitat on a recurring basis and could possibly impact EFH and the abundance, diversity, community composition of bottom dwelling finfish and invertebrates; however, over the timeframe considered, impacts from these activities are expected to remain stable. Commercial and recreational fishing using other methods results in mortality of finfish and invertebrates through harvest and bycatch. In the most recent ecosystem evaluation for the Mid-Atlantic Bight, Atlantic mackerel and bluefish were the only species identified as overfished (NOAA Fisheries 2021c). Other managed species were found not to be overfished, although other species may be overfished in other parts of the Atlantic. Dredging disturbs swaths of seafloor habitat. Impacts from the aforementioned activities are similar in nature but greater in extent (spatially and temporally) than those caused by other bottom-directed IPFs that create a relatively narrow trench and backfill in the same operation, such as pipeline trenching or submarine cable emplacement.

Conclusion

Under the No Action Alternative, BOEM would not issue any commercial wind energy leases in the Central Atlantic WEA, and there would be no effects on finfish, invertebrates, and EFH attributable to the Proposed Action; however, BOEM expects ongoing activities and planned actions to have continuing regional impacts on finfish, invertebrates, and EFH over the timeframe considered in this EA (**Appendix D**).

Over the timeframe considered in this EA, local impacts on finfish, invertebrates, and EFH from climate change are likely to be small, incremental, and difficult to discern from effects of other ongoing actions. The largest ongoing contributor to impacts on finfish, invertebrates, and EFH stems from commercial and recreational fishing.

During reasonably foreseeable offshore wind energy development on existing leases or easements (**Appendix D**), finfish, invertebrates, and EFH would be impacted by anchoring/mooring activities, installation of associated undersea cables, installation of new wind turbines and offshore substation foundations, and vessel traffic, with additional impacts from lighting and noise associated with all ongoing and planned actions.

Pile driving would result in the greatest potential noise-related impacts, as described in the previous EAs and offshore wind Draft and Final EISs (**Table 2-1**).. Noise generated during pile driving in adjacent leases can be transmitted through water and/or through the seabed; the level of noise can cause injury and mortality, result in moderate short-term stress and behavioral changes to finfish and invertebrates, and cause EFH to be unsuitable while pile driving is occurring. The impact of pile-driving noise on finfish and invertebrates would depend on the time of year it occurs and could be greater if the noise occurs in spawning habitat during a spawning period, particularly for species that aggregate to spawn (e.g., Atlantic cod), use sound to communicate (e.g., Atlantic cod), or spawn only once during their lifetime (e.g., longfin squid). The installation of wind energy structures (wind turbines and offshore substation foundations) could result in hydrodynamic disturbance, fish aggregation, increased entanglement of lost fishing gear, habitat conversion, and migration disturbances locally; impacts would vary seasonally and regionally (ICF Incorporated 2021).

Wind energy structures in the geographic analysis area also may have potential effects on the Mid-Atlantic Bight cold pool (BOEM 2021b; 2021c). Offshore wind lease areas in the Planned Action Scenario (**Appendix D**) are mostly sited within shallower depths than those in which the cold pool is located (Lentz 2017). While offshore wind foundation structures would affect local mixing of cool bottom waters with warm surface waters, the extent to which these local effects may affect the cold pool as a whole is not well understood. Given the size of the cold pool (approximately 30,000 km^2 [NOAA Fisheries 2020]), BOEM does not anticipate that planned offshore wind farms would negatively affect the cold pool as a whole, although they could affect local conditions. However, the potential effects of extensive wind farm development on features like the cold pool is a topic of emerging interest and ongoing research (Chen et al. 2016). Changes in cold pool dynamics could occur from planned offshore wind farms and potentially could result in changes in habitat suitability and fish community structure. Further, any potential effects would be analyzed, and new analyses would be incorporated in subsequent NEPA documents at the COP stage of the wind energy development process.

As discussed in **Section 3.3.1**, offshore wind structures could attract some fish species, resulting in increased predation on benthic resources; recreational and commercial fishing efforts could increase nearby as well. The dominant habitat type in the region is sand or softbottom, and these structures would create new hard surfaces that may provide habitat for benthic resources. Some impacts on finfish and benthic species could occur from these planned actions. Proposed wind energy projects (i.e., full turbine buildout) in the geographic analysis area (not including/apart from the Proposed Action [i.e., lease issuance]) and potential site assessment and site characterization activities have been evaluated or are being elevated for potential effects (BOEM 2021c; 2021d; NMFS 2020a). Considering all the IPFs together, BOEM anticipates that the overall impacts associated with ongoing and reasonably foreseeable planned actions in the geographic analysis area may result in **moderate** adverse impacts on finfish, invertebrates, and EFH because the overall effect would be unavoidable, but the resource would be expected to fully recover.

3.3.4 Marine Mammals

The 38 species of marine mammals that occur on the Central Atlantic are composed of 7 large whale, 20 dolphin (including two distinct common bottlenose dolphin [*Tursiops truncatus*] stocks[6], 5 beaked whale, 1 porpoise, 1 manatee, and 4 seal species are known to occur year-round, seasonally, and/or incidentally in the Mid-Atlantic OCS. BOEM (2016) provides detailed information on these marine mammals, including sightings information, and is incorporated here by reference. All 31 species are protected by the MMPA. In addition, 3 marine mammal species are protected under the ESA; these species are listed as endangered and include the fin whale, North Atlantic right whale (NARW), and sperm whale. The sperm whale is primarily found in deeper waters seaward of the WEAs, while NARWs and fin whales are considered to be seasonally “common” in the WEAs. The fin whale has a designated biologically important feed area east of Montauk Point (LaBrecque et al. 2015). There is no designated critical habitat for any endangered and threatened species in the Central Atlantic.

[6] The MMPA defines a marine mammal stock as a group of individuals “of the same species or smaller taxa in a common spatial arrangement that interbreed when mature.”

Perhaps the marine mammal species of most concern found in the region is the NARW, as estimates indicate there are between 345 and 369 individuals currently living in waters from offshore Newfoundland to the southeast U.S. (Pettis et al. 2021). The authors of this study derive their estimates from historically and emerging high-use habitats and migratory corridors across the region. Another right whale abundance model indicated that the population estimate is 368 individuals (Pace 2021). All coastal waters from Massachusetts to Florida have been identified as a biologically important area for the NARW and essential for their seasonal migration.

The *U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessment 2022* (Hayes et al. 2023) indicates that, for most marine mammal species found regularly in the Central Atlantic, there are insufficient data to determine population trends. However, the NARW population declined in abundance from 2011 to 2018. During the 2019 to 2020 calving season, 10 calves were observed (up from 7 during the 2018 to 2019 season), but births were significantly below what has been observed in past years (39 calves in 2009), and the species continues to be in decline (Pettis et al. 2021). The humpback whale has undergone a status change from the 2019 stock assessment (Hayes et al. 2020) and is now a strategic stock (Hayes et al. 2021).

Marine mammals in the geographic analysis area are subject to a variety of ongoing human-caused impacts, including strikes with vessels (ship strikes), entanglement with fishing gear, fisheries bycatch, anthropogenic noise, disturbance of marine and coastal environments, effects on benthic habitat, and climate change (Hayes et al. 2020). Many marine mammal migrations cover long distances, and these factors can have impacts on individuals over broad geographical scales. Climate change has the potential to impact the distribution and abundance of marine mammal prey due to changing water temperatures, ocean currents, and increased acidity; see BOEM (2019d) and NMFS (2020a) for discussion of climate change effects on marine mammals.

Entanglement in fishing gear is a substantial ongoing threat to marine mammals. Fisheries interactions are estimated to result in global mortality exceeding hundreds of thousands of individuals each year (Read et al. 2006; Reeves et al. 2013; Thomas et al. 2016). In the Atlantic, bycatch occurs in various gillnet and trawl fisheries off the Mid-Atlantic Coast, with hotspots driven by marine mammal density and fishing intensity (Benaka et al. 2019; Lewison et al. 2014). NARW has been experiencing an unusual mortality event (UME) since 2017 attributed to vessel strikes and entanglement in fishing gear (NOAA Fisheries 2023). In 2017, a total of 31 mortalities, serious injuries, and morbidities (sublethal injury and illness) were documented. Between 2017 and October 2023, a total of 121 mortalities, serious injuries, and morbidities of NARW were documented (NOAA Fisheries 2023). Additionally, bottom trawling and benthic disruption have the potential to result in impacts on prey availability and distribution.

Conclusion

Under the No Action Alternative, BOEM would not issue any commercial wind energy leases in the Central Atlantic WEAs, and there would be no effects on marine mammals attributable to the Proposed Action. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on marine mammals over the timeframe considered in this EA (**Appendix D**).

Over the timeframe considered in this EA, local impacts on marine mammals from climate change are likely to be small, incremental, and difficult to discern from effects of other ongoing actions. The largest ongoing contributors to impacts on marine mammals stem from commercial marine vessels and commercial and recreational fishing activities primarily through vessel strikes and entanglement risk.

During reasonably foreseeable offshore wind energy development on existing leases or easements (**Appendix D**), marine mammals would be impacted by anchoring/mooring activities, installation of associated undersea cables, installation of new wind turbines and offshore substation foundations, and vessel traffic, with additional impacts from lighting and noise associated with all the ongoing and planned actions.

Construction from reasonably foreseeable wind energy development in the geographic analysis area, most notably from pile driving, would create airborne and underwater noise with **minor** potential to affect NARWs and **moderate** potential to affect all other mysticetes, odontocetes, and pinnipeds**.** An individual may be exposed to anywhere from a single pile-driving event (lasting no more than a few hours on a single day) to intermittent noise over a period of weeks (or longer) if an individual travels over the larger geographic analysis area where pile driving may be occurring for multiple projects. Effects range from low-level behavioral effects to temporary hearing impairment (Wood et al. 2012). Hearing damage could impair a whale's ability to communicate, which could affect the ability to find a mate. If a NARW were to experience permanent threshold shift (PTS) despite the mitigation measures implemented, such an impact could be significant for NARWs. Hearing damage may also impair foraging and predator avoidance (Weilgart 2007). Behavioral effects resulting from less intense sounds include disturbance, changes in diving or calling behavior, and avoidance of the ensonified area, as summarized by ICF Incorporated (2021). These behavioral effects could interrupt critical functions, such as foraging, or cause increased energy expenditure. Less intense sounds can also lead to masking effects, which can reduce species communication distances or impair the ability to detect prey and/or predators; see discussions in BOEM (2021b; 2021d).

The available literature reviews suggest that individual marine mammals avoid disturbing levels of noise by swimming away from the noise source, with the duration of avoidance varying greatly, indicating that marine mammal responses to pile driving in the offshore environment are unpredictable and likely context-dependent (BOEM 2021c; 2021d; ICF Incorporated 2021). Permanent sublethal hearing injuries, although possible, are unlikely to occur based on current and anticipated future impact avoidance and minimization requirements. BOEM requires all future COPs to include project-specific mitigation and monitoring measures developed through NEPA, ESA consultations, and incidental take authorizations (ITAs) designed to avoid exposure of individuals to injurious levels of noise and minimize and monitor effects of exposure that would result in behavioral responses. These measures would reduce the overall impacts on any individual by reducing project-specific impacts.

Other sources of noise from wind projects include helicopters and aircraft used for transportation and facility monitoring, HRG surveys, turbine operation, cable installation, and vessel traffic associated with these activities. Depending on their distribution in relation to construction activities and the timing of that construction, the duration and frequency of any exposure of marine mammals to construction noise would be variable, but impacts of acoustic effects are expected to be greatest for baleen whales. The potential for biologically significant responses is expected to increase with increased exposure to multiple events, and when considering the number and extent of wind energy projects planned in the geographic analysis area (**Appendix D**), it is possible that underwater noise impacts sufficient to cause adverse effects on marine mammals could occur under the No Action Alternative.

Offshore wind structures could alter marine mammal movement patterns. The structures could attract some fish species, resulting in increased marine mammal prey availability, and recreational and commercial fishing efforts could increase nearby and present entanglement and strike risks to marine mammal species (ICF Incorporated 2021). These structures may also displace marine mammals from preferred habitats or alter movement patterns (particularly during construction), potentially changing exposure to commercial and recreational fishing activity (ICF Incorporated 2021). Overall, the combined effects of the presence of wind farm structures on marine mammals are variable—ranging from incrementally adverse to incrementally beneficial—and difficult to predict with certainty.

Various research programs have been proposed to study interactions between marine mammals and wind energy activities. The collection of data related to protected species could be used to assist in future analyses of offshore activities, development of additional avoidance and minimization measures, and gain a better understanding of habitat utilization in the Central Atlantic. Under the No Action Alternative, data collection to support such research programs may still occur.

Proposed wind energy projects (i.e., full turbine buildout) in the geographic analysis area (not including the Proposed Action [i.e., site assessment and characterization following issuance of a lease]) have been evaluated for potential effects on marine mammals from entanglement, vessel strikes, and noise. NMFS conducted a broad assessment of the effects of installing met buoys, conducting geophysical and geotechnical surveys with specified HRG equipment, and conducting associated vessel activities for offshore wind energy development projects off the U.S. Atlantic Coast (Anderson 2021). They found that if projects meeting the design criteria implement certain avoidance and mitigation measures, the activities are not likely to adversely affect any ESA-listed species under NMFS's jurisdiction. NMFS also published a biological opinion describing the effects of the construction, operation, and eventual decommissioning of the proposed Coastal Virginia Offshore Wind Commercial Project offshore Virginia (NMFS 2023). That assessment concluded that some project activities are likely to affect (or "take") ESA-listed species, mainly by behavioral disturbance; however, given the conservation status of NMFS species, together with the past, present, and anticipated future impacts on the species and habitat, the amount of anticipated take will not jeopardize the continued existence of any ESA-listed species under NMFS' jurisdiction. Other analyses have reached similar conclusions (**Table 2-1**).

Considering all the IPFs of the No Action Alternative together, BOEM anticipates that the overall impacts associated with reasonably foreseeable planned actions as well as the environmental baseline in the geographic analysis area may result in **minor** adverse impacts for NARWs and **moderate** adverse impacts for all other mysticetes, odontocetes, and pinnipeds because the overall effect would be unavoidable, as some individuals will likely experience disturbances, but the majority of affected individuals would be expected to fully recover, and no population-level impacts will occur among marine mammals of the Central Atlantic.

3.3.5 Military Use and Navigation/Vessel Traffic

The Central Atlantic project area consists of three WEAs, identified as WEA A-2 on the north end of the project area and offshore from Delaware Bay, WEA B-1 offshore from Maryland, and WEA C-1 offshore from Virginia and sharing its western border with the Coastal Virginia Offshore Wind Commercial (CVOW-C) Project (OCS-A 0483). **Figure 3-2** shows the ATONs and TSSs within the vicinity of the WEAs.

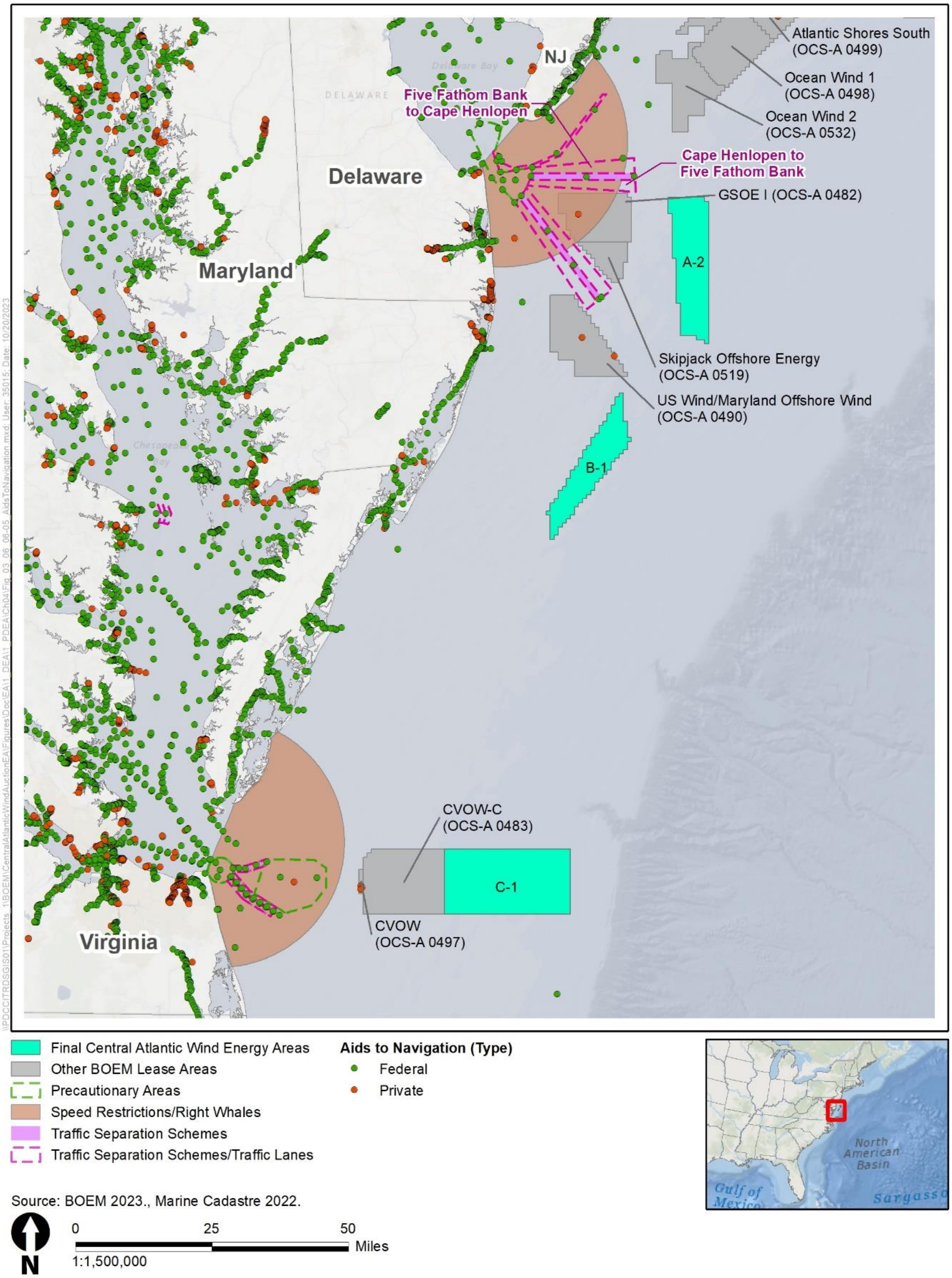

Figure 3-2. Traffic Separation Schemes and Aids to Navigation near the Central Atlantic Wind Auction Wind Energy Areas

As shown in **Figure 3-3**, military use in the vicinity of the Central Atlantic WEAs is primarily to the south near WEA C-1. Military vessels, such as carriers, destroyers, and cruisers, were primarily inbound or outbound from Naval Station Norfolk and the Joint Expeditionary Base–Little Creek within the Chesapeake Bay conducting training within the Virginia Capes Range Complex and Operating Area and Range Complex (VACAPES), not within WEA C-1. More information on military vessel traffic in this area can be found in the CVOW-C COP, Section 4.4.8 (Dominion Energy 2023) and also in 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 2012).

Notification of the final Consolidated Port Approaches Port Access Route Studies (CPAPARS) was published in the *Federal Register* on August 28, 2023. The final report, published by USCG, contains the study results of four regional Port Access Route Studies (PARS): the Northern New York Bight; Seacoast of New Jersey Including Offshore Approaches to the Delaware Bay, Delaware; Approaches to the Chesapeake Bay, Virginia; and the Seacoast of North Carolina Including Approaches to the Cape Fear River and Beaufort Inlet, North Carolina).

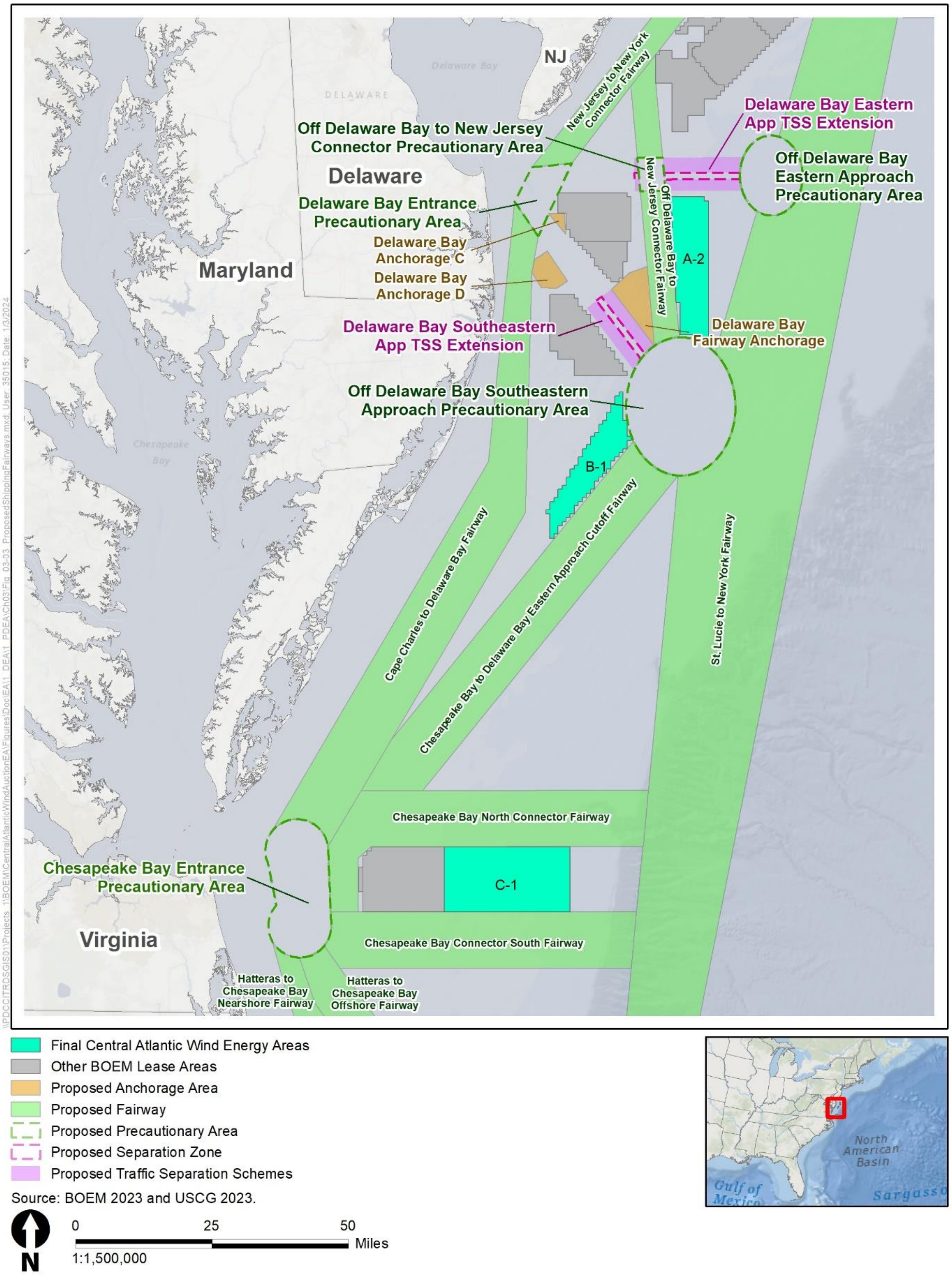

Figure 3-3. Proposed Vessel Routing Measures near the Central Atlantic Wind Auction Wind Energy Areas

There is a deep draft vessel traffic lane and a tow-tug extension at the entrance to NY harbor and running south near WEA A-2 but far enough to the west so that vessel traffic in the lane should not have an impact within WEA A-2. WEA B-1 is located offshore of Delaware Bay. The entrance to Delaware Bay is approximately 27 nm (50 km) west of WEA A-2. There are several routing measures[7] that regulate vessel traffic to help ships avoid navigational hazards in the vicinity of the WEAs. Vessel traffic in and out of Delaware Bay is regulated by a TSS, which is approximately 6 nm (11 km) from WEA A-2 (Figure 3.2). The TSS within the approach to Delaware Bay consists of four parts: an Eastern Approach, a Southwestern Approach, a Two-Way Traffic Route, and a Precautionary Area (33 CFR 167.170). The Inbound Five Fathom Bank to Cape Henlopen Traffic Lane, the Eastern Approach of the TSS is primarily a shipping route for deep-draft vessels. The Two-Way Traffic Route is used primarily by tug and barge vessels entering and exiting Delaware Bay. The Southeast Approach is approximately 12 nm (28 km) from WEA B-1 and approximately 87 nm (162 km) from WEA C-1.

The central parcel, WEA B-1, offshore of Maryland, is located in between major ports; however, there are three fairways nearby that will need to be considered for impacts on vessel traffic and cable crossings: the Cape Charles to Delaware Bay Fairway is the westernmost and closest to shore; the Chesapeake Bay to Delaware Bay Eastern Approach Cutoff Fairway and the St. Lucie to New York Fairway are to the east of the parcel (www.navcen.uscg.gov/port-access-route-study-reports).

The southernmost parcel, WEA C-1, will need to consider several routing measures that regulate vessel traffic to help ships avoid navigational hazards in the vicinity of the Chesapeake Bay. Vessel traffic in and out of Chesapeake Bay is regulated by the Chesapeake Bay TSS consisting of a Southern Approach and an Eastern Approach converging on a Precautionary Area (33 CFR 167.200). On the Southern Approach, the inbound and outbound traffic lanes are separated by a two-way deep-water route (DWR) for deep-draft vessels or naval aircraft carriers. The WEA is located partially within the Chesapeake Bay to Delaware Bay: Eastern Approach Cutoff Fairway, as described in the USCG CPAPARS. The fairway is about 200 miles (322 km) long, approximately 10 nm (18.5 km) wide and includes the customary route taken by vessels transiting between the Port of Virginia; the Port of Baltimore, Maryland; the Port of Philadelphia, Pennsylvania; and the Port of Wilmington, Delaware (USCG 2022).

Over the 5- to 7-year timeframe considered in this EA, national security and military interests will continue to use the onshore and offshore areas in the geographic analysis area at a similar rate to current use. It is likely that vessel traffic associated with military vessels, commercial business craft (tugboats, fishing vessels, and ferries), commercial recreational craft (cruise ships and fishing/sight-seeing/diving charters), research vessels, and personal craft (fishing boats, houseboats, yachts and sailboats, and other pleasure craft) will continue using ports and trafficking within the geographic analysis area. Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). Despite this determination, the general trend along the coastal region from Delaware to North Carolina is that port activity will increase minimally over the timeframe considered.

[7] The term *routing* measure originates from the International Maritime Organization. The International Convention for the Safety of Life at Sea, Chapter V, recognizes the International Maritime Organization as the only international body for establishing routing measures (https://www.imo.org/en/OurWork/Safety/Pages/ShipsRouteing.aspx). USCG submits and obtains approval for routing measures within U.S. navigable waters to the International Maritime Organization. Areas to Be Avoided, Inshore Traffic Zones, No Anchoring Areas, Precautionary Areas, Roundabouts, and Traffic Separation Schemes are all routing measures (USCG 2020a, Appendix B).

Conclusion

Under the No Action Alternative, BOEM would not issue any commercial wind energy leases in the Central Wind WEA, and there would be no effects on military use and navigation/vessel traffic attributable to the Proposed Action; however, BOEM expects ongoing activities and planned actions to have continuing regional impacts on military use and navigation/vessel traffic over the timeframe considered in this EA (**Appendix D**). Over the timeframe considered in this EA, impacts on military use and navigation/vessel traffic from climate change are likely to be small, incremental, and difficult to discern from effects of other ongoing actions.

Ongoing actions resulting in vessel traffic in the geographic analysis area primarily include marine transportation (commercial shipping) and commercial and recreational fishing; however, both activities have co-existed with military use activities in the Central Wind project area for a substantial amount of time. In addition, vessels and aircraft conducting military operations are typically working in military Operation Areas (OPAREAs) away from commercial traffic lanes. All project types listed in the Planned Action Scenario (**Appendix D**) would result in increased vessel traffic in the region; some planned actions would introduce structures (such as met buoys, wind turbines, and offshore substations) that may present risks of allision and collision, as well as obstacles to navigation. Presence of structures associated with reasonably foreseeable offshore wind energy development would impact military and national security vessels and other vessel traffic in the geographic analysis area primarily through risk of allision and collision with stationary structures and other vessels. Deep-draft military vessels are not anticipated to transit outside of navigation channels unless necessary for search and rescue or nontypical operations. Allision risks for smaller vessels moving within or near planned offshore wind structures would be higher. However, these risks would be minimized by projects adhering to USCG and BOEM structural lighting requirements, which would provide lighting at sea level. Risk of allision with commercial or recreational fishing vessels could indirectly increase as a result of the fish aggregating effect around the offshore wind facility structures. Furthermore, increased vessel traffic due to construction of planned offshore wind facilities could lead to course changes of military and national security vessels, congestion and delays at ports, and increased traffic along vessel transit routes.

As offshore wind development structures are built, aircraft navigation patterns and complexity would incrementally increase. These changes could compress lower altitude aviation activity into more limited airspace above the offshore WEAs, potentially leading to airspace conflicts or congestion and increasing collision risks for low-flying aircraft.

Considering all the IPFs together, BOEM anticipates that the overall impacts associated with ongoing and reasonably foreseeable planned actions in the geographic analysis area over the timeframe considered would result in **minor** adverse impacts on military use and navigation/vessel traffic.

3.3.6 Sea Turtles

Four species of sea turtles occur in the Central Atlantic. Of the four species, hatchling, juvenile, and adult loggerhead, leatherback, green, and Kemp's ridley sea turtles are expected to occur in the vicinity of the WEAs, and all four species are listed as either endangered or threatened under the ESA. The hawksbill sea turtle is considered rare in the Central Atlantic and is therefore not expected to occur in the WEAs. For information regarding sea turtles' life history, behavioral ecology, and hearing abilities, see Kenney and Vigness-Raposa (2010), Mangi Environmental Group (2011), and Baker and Howson (2021).

Sea turtles are wide-ranging and long-lived, making population trends and estimates difficult. Leatherback nesting trends have been found to vary by region, with overall trends being generally negative (Wallace and Eckert 2018). For loggerhead sea turtles, progress toward recovery has been made since publication of the 2008 Loggerhead Sea Turtle Recovery Plan, but recovery units have not met most of the critical benchmark recovery criteria (NMFS and USFWS 2019). Recent models indicate a persistent reduction in survival and/or recruitment to the nesting population of Kemp's ridley, suggesting that the population is not recovering to historical levels (NMFS and USFWS 2015). The most recent status review for the North Atlantic distinct population segment of green sea turtles estimates that nesting trends are generally increasing (Seminoff et al. 2015). However, a study by Ceriani et al. (2019) has indicated that using nest counts as a direct proxy for adult female population status can be misleading and is not evidence of a strong population recovery.

Regional, pre-existing threats to sea turtles include entanglement in fisheries gear, fisheries bycatch, and vessel strike. Globally, entanglement in and ingestion of human-made debris is a substantial threat to sea turtles, and it is believed that entanglements are underestimated, as not all are reported (Duncan et al. 2017). In the WEAs, leatherback sea turtles are the primary species at risk of becoming entangled, but loggerhead and green sea turtles also occur (BOEM 2021c). Research by Duncan et al. (2017) estimated that over 1,200 entangled sea turtles are encountered per year globally, with just over a 90% mortality rate. Commercial fisheries occurring in the Central Atlantic, as part of the Mid-Atlantic Region include bottom trawl, midwater trawl, dredge, gillnet, longline, and pots and traps (BOEM 2016). Commercial vessel traffic in the region is variable, depending on location and vessel type. The commercial vessel types that transit through the Central Atlantic include cargo, passenger, recreational, tug-tow, military, and tanker (BOEM 2021a). Climate change has the potential to impact the distribution and abundance of sea turtle prey, due to changing water temperatures, ocean currents, and increased acidity; changing water temperature may also affect sea turtle nesting range (see BOEM (2019d) and NMFS (2020a) for discussion of climate change effects on sea turtles).

Conclusion

Under the No Action Alternative, BOEM would not issue any commercial wind energy leases in the Central Atlantic WEA, and there would be no effects on sea turtles attributable to the Proposed Action; however, BOEM expects ongoing activities and planned actions to have continuing regional impacts on sea turtles over the timeframe considered in this EA (**Appendix D**).

Over the timeframe considered in this EA, local impacts on sea turtles from climate change are likely to be small, incremental, and difficult to discern from effects of other ongoing actions. The largest ongoing contributors to impacts on sea turtles stem from commercial marine vessels and commercial and recreational fishing activities, primarily through vessel strikes and entanglement risk.

During reasonably foreseeable offshore wind energy development on existing leases or easements (**Appendix D**), sea turtles may be impacted by anchoring/mooring activities, installation of associated undersea cables, installation of new wind turbines and offshore substation foundations, and vessel traffic, with additional impacts from lighting and noise associated with all the ongoing and planned actions.

Construction from reasonably foreseeable wind energy development in the geographic analysis area, most notably from pile driving, would create airborne and underwater noise. Sea turtles close to impact pile driving could potentially experience a temporary or permanent loss of hearing sensitivity, and reduced hearing sensitivity could limit the ability to detect predators and prey or find potential mates, reducing the survival and fitness of affected individuals (Finneran et al. 2017; Popper et al. 2014). For example, behavioral effects from impact pile driving of an 8-m monopole could be experienced by sea turtles within approximately 1 mile (1.6 km) of the pile (Denes et al. 2018). If sea turtles are present within the ensonified area, potential behavioral impacts may include altered submergence patterns, short-term disturbances, startle responses (diving or swimming away), short-term displacement of feeding/migrating, and temporary stress responses, as discussed in BOEM (2021b; 2021d) and NSF and USGS (2011). The accumulated stress and energetic costs of avoiding repeated exposure to pile-driving noise over a season or a life stage could potentially have long-term impacts on survival and fitness; see (U.S. Navy 2018) for summary information. In contrast, sea turtles could become habituated to repeated noise exposure over time and not suffer long-term consequences as demonstrated even when the repeated exposures were separated by several days (Moein et al. 1994). While these potential impacts are acknowledged, their potential significance is currently unclear because sea turtle sensitivity and behavioral responses to underwater noise are a subject of ongoing study.

BOEM requires all wind energy COPs on the OCS to include project-specific mitigation and monitoring measures designed to reduce exposure of sea turtles to injurious levels of noise. This requirement will reduce the baseline level of impacts on sea turtles in the geographic analysis area that are likely to occur irrespective of the Proposed Action. Based on current and anticipated future impact avoidance and minimization requirements, it is anticipated that only a small number of individuals would be present close to construction activities, and impacts on sea turtles from construction-related noise would likely be limited to **minor** or **moderate** short-term effects on a small number of individuals and would not be significant at the population level.

Proposed wind energy projects in the geographic region (not including the Proposed Action) have been evaluated for potential effects on sea turtles from entanglement, vessel strikes, and noise. NMFS conducted a broad assessment of the effects of survey and data collection related activities for offshore wind energy development projects off the U.S. Atlantic Coast (Anderson 2021). They found that if projects meeting the design criteria implement certain avoidance and mitigation measures, the activities are not likely to adversely affect any ESA-listed species under NMFS's jurisdiction. Furthermore, NMFS published a biological opinion describing the effects of the construction, operation, and eventual decommissioning of the proposed Ocean Wind 1 project northeast of the Central Atlantic (NMFS 2023). That assessment concluded that pile driving is likely to adversely affect ESA-listed sea turtles, mainly from behavioral disturbance, but given the avoidance and mitigation measures, the anticipated effects likely will not jeopardize the continued existence of sea turtles. Other analyses have reached similar conclusions (**Table 2-1**).

Other sources of noise from reasonably foreseeable wind projects include helicopters and aircraft used for transportation and facility monitoring, HRG surveys, turbine operation, and vessel traffic associated with these activities. Depending on their distribution in relation to the other noise sources and the timing of activities generating noise, the duration and frequency of any exposure of sea turtles to the other noise would be variable but anticipated to only result in behavioral disturbance impacts (NMFS 2013, 2020a). However, accumulated stress and energetic costs of avoiding repeated exposure to noise sources over a season or a life stage could have long-term effects on survival and fitness.

As discussed in **Section 3.3.1**, attraction effects from foundations are likely beneficial to sea turtles, due to the improved feeding opportunities; however, these beneficial effects would be offset by negative effects associated with increased interactions with fishing gear or increased risk of vessel strikes (ICF Incorporated 2021). Overall, the combined effects of the presence of wind farm structures on sea turtles are variable—ranging from incrementally adverse to incrementally beneficial—and difficult to predict with certainty.

Considering all the IPFs together, BOEM anticipates that the overall impacts associated with ongoing and reasonably foreseeable planned actions in the geographic analysis area may result in **moderate** adverse impacts on sea turtles because the overall effect would be unavoidable, as some individuals will likely experience disturbances, but the majority of affected individuals would be expected to recover completely, and population numbers are not anticipated to be affected.

3.4 Alternative B – Proposed Action/Preferred Alternative

The Proposed Action/Preferred Alternative is analyzed alone and in combination with the changing baseline conditions as described in the No Action Alternative - Affected Environment section (**Section 3.3**).

3.4.1 Benthic Resources

The main impacts on benthic organisms from routine Proposed Action activities include crushing or smothering of organisms by anchors and moorings, geotechnical and benthic equipment, and clump anchors for the met buoys. Impacts from these samplings are expected to be limited to the immediate area of the activity and a maximum area of disturbance of 118 m^2 of seafloor from the meteorological buoy between its clump anchor and mooring chain (BOEM 2014a). In addition, the data collected during HRG surveys could identify certain benthic habitat features (e.g., complex habitat), allowing the lessee to develop and implement appropriate avoidance measures for placement of anchors and moorings and clump anchors for met buoys. Larger, mobile benthic organisms (e.g., lobsters, crabs) may be able to avoid lethal impacts but would still experience displacement within the footprint of project-related infrastructure. Additionally, sediment suspension and redistribution during met buoy deployment could interfere with the filter-feeding mechanisms of bivalve mollusks (e.g., scallops), but this impact would be short term, localized, and only occur for a maximum of eight met buoys in the entirety of the WEAs. Because sonar, sub-bottom profiling, magnetometry, and benthic imaging (e.g., video) involve remote sensing of the seafloor, these site characterization activities would not physically alter the benthos.

Sub-bottom profilers, such as boomers, emit intense sound pulses. There is limited data regarding the effect of sound on benthic invertebrates. A review of available studies indicated that such sound pulses have minimal effects on marine invertebrates (Carroll et al. 2017). In general, particle motion is most relevant to frequencies below 1,000 hertz (Hz) and within close ranges to the source (within tens of meters), although some information suggests that fish and invertebrates may perceive the sound at greater distances (Popper and Hawkins 2018; Weilgart 2018). At longer ranges from the source, it is expected that particle motion associated with impulsive noise sources (e.g., medium sub-bottom profilers) will have similar effects on pressure waves in fish and invertebrate species (Weilgart 2018). Additionally, because there are no accepted thresholds for particle motion for which the potential for impact may be assessed, particle motion impacts were not evaluated separately from sound pressure impacts. Geotechnical and benthic sampling may disturb, injure, or cause mortality to benthic resources in the immediate area sampled.

BOEM estimates that approximately 1,004 geotechnical/benthic samples would be taken by lessees for site characterization under Alternative B (see **Appendix A** for geotechnical/benthic sampling calculations). The physical bottom-sampling footprint for each collection is dependent upon the sampling device used but in general is anticipated to be on the order of 1 to 10 m^2 per sample (BOEM 2014a; Fugro Marine GeoServices Inc. 2017). Actual areas sampled are small, but some instruments are positioned in large frames that land on the seafloor, expanding the sampling footprint and potentially crushing benthic resources. The impacts of the small footprint of the samples over the WEAs and along potential transmission cable routes of the Central Atlantic are not expected to result in the loss of any species diversity or ecosystem function. Additionally, recovery of the softbottom benthic environment could take a few months to a few years depending on the substrate composition (with sandy substrates recovering more quickly than silt/clay). Organisms from adjacent, unaffected sediments could migrate to the location where a grab or core had been taken, facilitating recovery. Benthic impacts from site characterization activities are expected to be minor.

Beds of SAV and purpose-built artificial reefs are not present in the WEAs but could be present along the transmission cable routes closer to shore and could be impacted by bottom sampling. Additional nearshore habitats that could be impacted by bottom sampling include shellfish beds and estuarine habitats. However, specific transmission cable routes to shore are unknown at this stage, making it difficult to determine the extent to which these types of habitats could be impacted. Nevertheless, the number of inshore samples collected along the transmission cable route is expected to be small along each route corridor, and inshore sampling would require specific state permits and may be subject to mitigation measures at that stage. Additionally, there are no known locations of stony or soft corals in the WEAs, and the seafloor is ranked as “low suitability” habitat for these organisms (BOEM 2012; 2016). Hardbottom habitats (e.g., rocky reef communities) may exist in small, isolated patches, and data collected during initial remote geophysical surveys and existing data sources would sufficiently characterize the benthic resources so that sensitive habitats are avoided to the maximum extent practicable. BOEM would require lessees to develop and implement avoidance measures near these resources before authorizing activities that would disturb the seafloor.

Biological surveys—primarily fishery surveys, including trawl, gillnet, ventless trap, and shellfish surveys, but also placement of fixed gear and passive acoustic monitoring mooring equipment—and the use of sediment profile and plan view imaging equipment would likely result in some benthic disturbance and direct mortality to benthic species (Baker and Howson 2021). These activities could also reduce the amount of prey available to sea turtles, marine mammals, and marine fish, including Atlantic sturgeon. However, given the limited extent and duration of bottom-disturbing survey activities relative to the amount of habitat available in the geographic analysis area, these activities are unlikely to have a measurable effect on the feeding behavior and biological fitness of any individual fish. Generally, the impacted areas would be small, and surveys would be conducted with estimated frequencies and durations as described in **Appendix A**. These surveys would also occur infrequently and would be of limited duration. Expected mortality and benthic disturbance is anticipated to be undetectable within the overall benthic regime, and impacts on benthic resources are expected to be negligible.

Based on previous proposals, anchors for boat-shaped or discus-shaped buoys would each weigh about 2,721 to 4,536 kg and have a footprint of about 0.5 m^2 and an anchor sweep of about 34,398 m^2 (BOEM 2014a; Fugro Marine GeoServices Inc. 2017). The maximum number of buoys expected for the project is eight, resulting in a potential impact on softbottom habitat from anchors of 4 m^2. A total of 68 acres of seafloor could be affected, assuming that the maximum number of met buoys (eight) are installed, that all buoys are either boat-shaped or discus-shaped, and that they disturb the maximum area of seafloor. Affected areas are expected to recover within a few months to a few years (with sandy substrates recovering more quickly than silt/clay) after decommissioning of the buoy (Brooks et al. 2006; Kritzer et al. 2016; Lindholm et al. 2004). Note that the anchor cable would not make complete contact with all areas of the bottom within its sweep (BOEM 2016), and use of spar-type buoys would decrease the area of impact significantly. Thus, benthic impacts from buoy installation and operation are expected to be minor. A met buoy clump anchor would increase the hard surface available to support certain benthic organisms (e.g., mussels, barnacles, algae, other encrusting organisms), but this community would be very different from that of the original softbottom community (Michel et al. 2007). With a maximum of only eight met buoys installed, this additional hard surface would be minimal.

Decommissioning of buoys is not expected to result in adverse impacts on benthic resources, as it requires a limited number of vessels and can be completed in 1 to 2 days depending on the buoy type (Baker and Howson 2021). Often a crane is used to remove the buoy, and divers perform site clearance activities to return the seafloor to its original state. Thus, benthic impacts from buoy decommissioning are expected to be negligible.

Some invertebrates are prey for listed species (e.g., whales, sea turtles, sturgeon), and impacts on benthic resources may alter the diet composition of these protected species. However, because the amount of benthic habitat affected by routine activities would be extremely small relative to the available foraging habitat in the region, any effects on protected species resulting from benthic disturbance are expected to be negligible (Anderson 2021; NMFS 2013).

Non-Routine Events

The recovery of lost survey equipment is a newly identified non- routine event from previous EAs (**Table 2-1**) and therefore is carried forward for analysis in this Draft EA. Recovery of lost survey equipment could potentially have benthic impacts. A commonly used method for retrieval of lost equipment is through dragging grapnel lines. A single vessel deploys a grapnel line to the seafloor and drags it along the bottom until it catches the lost equipment, which is then brought to the surface for recovery. This process could result in significant bottom disturbances, as it requires dragging the grapnel line along the bottom until it hooks the lost equipment, which may require multiple passes in a given area. In addition to dragging grapnel line along the bottom, after the line catches the lost equipment, it will drag all the components along the seafloor until recovery, resulting in additional benthic impacts.

Where lost survey equipment is not able to be retrieved because it is either small or buoyant enough to be carried away by currents or is completely or partially embedded in the seafloor (for example, a broken vibracore rod), additional bottom disturbance may occur. For example, a broken vibracore rod that cannot be retrieved may need to be cut and capped 1 to 2 m below the seafloor, resulting in additional bottom disturbance in the immediate vicinity of the lost equipment.

The extent of impacts related to the recovery of equipment would depend on the type of equipment lost. The size of the lost equipment and/or the replacement cost would dictate the number of attempts made at recovery. The number of attempts made at recovery would affect both the size of the resultant impact area and the time spent searching. Additionally, the location of the lost equipment could affect the level of impact on other resources. Because the WEAs are predominantly composed of sand substrate, it is generally anticipated that the benthos would recover quickly without remedial or mitigating action (Brooks et al. 2006; Kritzer et al. 2016; Lindholm et al. 2004). Impacts from non-routine events are expected to be negligible.

Conclusion

Impacts of site assessment and site characterization activities on benthic communities are expected to be **negligible** to **minor**. Primary effects of routine activities associated with the Proposed Action would be crushing and smothering by clump anchors and mooring chains. These impacts would be limited to the immediate footprint of the buoy and spread out across each WEA. The maximum area affected would be small for buoy-related activities. The recovery of affected benthic communities to pre-disturbance levels is expected to take from a few months to a few years, depending on the degree of impact and specific composition of the benthic substrate and associated community. BOEM would require a lessee to incorporate avoidance measures before physical sampling and met buoy installation near any hardbottom communities identified during geophysical surveying (**Section 4**).

Impacts on benthic communities from non-routine events are limited to those associated with the recovery of lost equipment. The extent of impacts would depend on the type of lost equipment. Given that the WEAs are predominantly composed of sand substrate, it is generally anticipated that benthic impacts from non-routine events are expected to be negligible because sand substrate recovers quickly without remedial or mitigating action.

Cumulative Impacts: The incremental impacts from the Proposed Action resulting from individual IPFs would range from negligible to minor for benthic resources. BOEM anticipates that the cumulative impacts associated with the Proposed Action and with ongoing and planned actions would be **moderate** for benthic resources in the geographic analysis area, because impacts are unavoidable, but the viability of benthic resources is not threatened. The main impact drivers, which are analyzed under the No Action Alternative, stem from recurring bottom disturbance from bottom-tending fishing gear and mortality resulting from the planned wind projects.

3.4.2 Commercial and Recreational Fishing

The Proposed Action site characterization and site assessment activities involve installation, maintenance, and decommissioning of met buoys within each WEA and surveys for site characterization within each WEA and along each potential transmission cable route. These activities would result in increased vessel traffic in the area and the temporary exclusion/displacement of vessels to prevent conflicts and strikes with survey vessels and gear. The Proposed Action includes installation of a maximum of eight met buoys, which takes approximately 1 to 3 days to complete depending upon met buoy type (**Section 2.4.4**). Exclusion/displacement as a result of survey activities involving geotechnical exploration and other operations are expected to be on the scale of hours and confined to the immediate area around the survey ship. Vessels not related to site characterization or site activities that may be transiting the area could use USCG notices (i.e., Local Notice to Mariners) to avoid the areas where buoys are being installed. Impacts on commercial and recreational fishing activities from surveys for site characterization could vary depending on the fishing gear type used (e.g., fishermen using fixed gear may need to retrieve their gear before a survey vessel could potentially transit over their gear in their fishing location).

Site characterization and site assessment activities are expected to take place in the spring and summer months, which would overlap with commercial and recreational fishing seasons. Commercial and recreational fishing would not be broadly excluded from the areas inside the WEAs or along the potential transmission cable routes; temporary exclusion would only be necessary within the immediate footprint of site characterization and site assessment activities. However, noise generated from low-frequency sound (produced by some survey equipment) may result in decreased catch rates of fish while the survey is occurring. Decreased catch rates may be most notable in hook and line fisheries because behavior changes may reduce the availability of the fish to be captured in the fishery (Lokkeborg et al. 2012; Pearson et al. 1992). The direct impacts of these noise sources on fish is analyzed in **Section 3.4.3** and are expected to range from negligible to minor.

As also noted in **Section 3.4.3**, met buoy clump anchors could provide previously unavailable habitat for species that prefer structured and hardbottom habitats, creating a temporary increase in these types of fish near the buoy while the structure is in place (ICF Incorporated 2021). Additionally, the buoys themselves may provide habitat for pelagic species, such as dorado (also known as dolphinfish) (ICF Incorporated 2021). Installation of met buoys could, therefore, have a temporary and limited beneficial effect on commercial and recreational fisheries, depending on the species of interest and the fishing gear used.

Impacts from seafloor disturbances are anticipated to range from negligible to minor for commercial and recreational fisheries. As described in **Sections 3.4.1** and **3.4.3**, mollusks (such as scallops) would likely be adversely affected (buried or crushed) in the immediate area of the buoy clump anchors and moorings and suffer from increases in suspended sediment load during the installation and decommissioning process; however, the area impacted by met buoy installations is small relative to the area available for commercial and recreational fishing. Impacts from biological surveys, primarily fishery surveys, would likely result in some direct mortality to commercially important finfish and invertebrates and could include impacts on ESA-listed species; these impacts are discussed in **Section 3.4.3**.

Prior to identification of the final Central Atlantic WEAs, major areas of fishing interest were excluded to minimize potential conflict between activities (BOEM 2021a). Similarly, most coastal recreational fishing for the Central Atlantic takes place outside of the boundaries of the WEAs (Geo-Marine Inc. 2010; New York Department of State 2013). Relative to existing vessel traffic, the Proposed Action would result in a nominal increase in vessel traffic, as outlined in **Appendix A**, that will be spread out over a 5- to 7-year period; therefore, impacts of increased vessel traffic on commercial and recreational fishing are anticipated to be negligible.

Although commercial fishing vessels may transit the WEAs enroute to historical fishing grounds, survey activities or met buoy installation activities likely would not interfere with access to active fishing grounds beyond the WEAs, except for the potential need to change transit routes slightly to avoid survey and installation vessels and installed met buoys. After met buoys are decommissioned and removed, the proposed sites are anticipated to pose no obstacle to commercial or recreational fishing.

There are numerous port and marina locations shoreward of the WEAs that may be used by commercial fishing vessels, recreational vessels, and project vessels. The projected number of vessel trips for site characterization and site assessment activities (**Appendix A**) at any of these ports or marinas would be small relative to existing use (**Section 4.2.5**) and are not expected to adversely impact current use of these facilities.

Non-Routine Events

Similar to the discussion presented in **Section 3.4.1**, the recovery of lost survey equipment could potentially have impacts on commercial and recreational fishing through the temporary displacement of fishing activities. The extent of impacts would depend on the type of lost equipment; the size of the lost equipment and/or the replacement cost would dictate the number of attempts made at recovery. The number of recovery attempts could affect the size of the resultant impact area and the time spent searching. The location of the lost equipment would also affect the impact on other resources.

Furthermore, lost survey equipment that is not recovered could interfere with commercial and recreational fishing activities by acting as a potential hazard for bottom-tending fishing gear. For example, a broken vibracore rod that cannot be retrieved may need to be cut and capped 1 to 2 m below the seafloor to remove the potential hazard, which would result in bottom disturbance to the immediate vicinity of the lost equipment. Most fishing gear penetrates < 1 m, but 2-m burial may be required and would be determined on case-by-case basis with BOEM and the Bureau of Safety and Environmental Enforcement (BSEE). In any case, the potential for recovery operations to interact with commercial or recreational fishing activities is low, given that recovery operations would likely involve one vessel for a short period of time; therefore, impacts are expected to be **negligible**.

Conclusion

Impacts on commercial and recreational fisheries under the Proposed Action for site assessment and site characterization activities are expected to range from **negligible** to **minor** depending on the fishery and Proposed Action activity, as effects would be notable, but the resource would be expected to recover completely without remedial or mitigating action. Minor impacts are expected based on multiple factors, including the low level of vessel traffic activity associated with site characterization and site assessment activities relative to existing traffic, the fact that up to eight met buoys would be installed over a relatively large geographic area, and the relatively small spatial area and limited duration of sound produced from routine activities and events. Communication and coordination between a lessee and affected fishermen could greatly reduce the potential for conflict during vessel movement and met buoy installation activities.

Cumulative Impacts: The incremental impacts under the Proposed Action resulting from individual IPFs are anticipated to range from negligible to minor for commercial and recreational fishing. BOEM anticipates that the cumulative impacts associated with the Proposed Action and with ongoing and reasonably foreseeable planned actions would be **moderate** for commercial and recreational fishing in the geographic analysis area, because some fishing operations would experience substantial disruptions for the entire timeframe under consideration even with remedial action. The main impact drivers stem from construction of offshore structures related to planned wind projects.

3.4.3 Finfish, Invertebrates, and Essential Fish Habitat

Review of previous lease issuance EAs and the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia EA (**Table 2-1**) identified potential impacts on fish resources and EFH that could occur in WEAs during site characterization and site assessment. Although all of these previous documents do not specifically address the Central Atlantic area, many species occur across all areas addressed in these previous documents, and their conclusions on impact levels are applicable to this EA. The following conclusions for site characterization that were made in previous EAs (where relevant) are expected to be the same in the Central Atlantic and will not be carried forward in this analysis, noting that information has been added where relevant to address recent scientific literature:

- Impacts from acoustic sound sources from HRG surveys and geotechnical exploration are expected to range from negligible to minor. Medium and shallow sub-bottom profilers are the only sound source expected to produce sounds within finfish and invertebrate hearing ranges (**Table 2-5**). Fish are not expected to be exposed to sound pressure levels (SPLs) that could cause hearing damage. While fishes can also detect particle motion at frequencies produced during HRG surveys, there is currently limited understanding of the potential effects of particle motion on fish and invertebrates (Popper and Hawkins 2018). In general, particle motion is most relevant to frequencies below 1,000 Hz and within close ranges to the source (within tens of meters), although some information suggests that fish and invertebrates may perceive the sound at greater distances. At longer ranges from the source, it is expected that particle motion associated with impulsive noise sources (e.g., medium sub-bottom profilers) will have similar effects on pressure waves in fish and invertebrate species (Weilgart 2018). Additionally, because there are no accepted thresholds for particle motion for which the potential for impact may be assessed, particle motion impacts were not evaluated separately from sound pressure impacts. Impacts would result in temporary and spatially limited changes in behavior and displacement, particularly to those species capable of hearing in the high-frequency range such as herrings. Additionally, no significant adverse effects on EFH for any pelagic species are anticipated.
- Impacts from vessel and equipment noise are expected to be negligible. Noise from vessels and equipment (other than the site assessment and site characterizations related equipment discussed in this section) would be temporary and spatially limited because vessels would be moving. Any potential impacts could result in behavioral changes (BOEM 2021c; 2021d). Vessel and equipment noise associated with the Proposed Action would be inconsequential relative to existing vessel noise in the geographic analysis area.

The EFH Assessment (**Appendix E**) includes a description and discussion of the potential activities considered under the Proposed Action and evaluates impacts on softbottom benthic, hardbottom benthic, and pelagic (water column) habitats and species.

Installation of clump anchors associated with met buoys may cause an increase in local suspended sediments. These impacts would be limited to the immediate area surrounding the anchors and of short duration. With a maximum of eight met buoys to be installed across all WEAs, these impacts are anticipated to be negligible. Installation clump anchors and associated mooring chain also may result in the direct mortality of benthic invertebrates and the loss of benthic habitat. Sessile (immobile) marine invertebrates, including molluscan shellfish, would be lost (buried or crushed) in the footprint of the clump anchor and the area of the anchor chain sweep, as discussed in **Section 3.4.2**. Although sea scallops are mobile shellfish, it is a conservative assumption that they would not be able to avoid sudden deployment of a clump anchor, and, for these analyses, they are considered to be sessile. The amount of habitat temporarily displaced or lost in the area is small compared to the amount of habitat available in the surrounding area, and the recovery of affected habitat to pre-disturbance levels is expected to take from a few months to a few years, depending on the degree of impact and specific composition of the benthic substrate and associated community. Fish and mobile invertebrates are expected to move to the surrounding areas during installation of a met buoy. Clump anchors could adversely affect EFH; however, these structures have a small footprint and are not expected to significantly affect the quality or quantity of EFH in the WEAs. Additionally, the WEAs are predominantly composed of sand substrate, and it is generally anticipated that the benthos would recover quickly (Brooks et al. 2006; Kritzer et al. 2016; Lindholm et al. 2004). Therefore, impacts from habitat loss due to met buoy installation on finfish, invertebrates, and EFH are expected to be negligible.

Met buoy clump anchors installed on soft substrates would introduce hard substrate to these areas that could be colonized by benthic invertebrates. Fish species that prefer hardbottom or complex habitats would likely be attracted to anchors, potentially increasing local fish abundance (ICF Incorporated 2021). Additionally, the buoys themselves may provide habitat for pelagic species, such as dorado (also known as dolphinfish) (ICF Incorporated 2021).Previous proposals have indicated that the maximum area of disturbance related to deployment of a spar-buoy occurs during anchor deployment/removal, resulting in a maximum area of disturbance of 118 m^2 of seafloor between its clump anchor and mooring chain (BOEM 2014a). The mooring placements would avoid complex habitat and would be short term as they would be removed once the buoys are decommissioned. Changes in species composition and community assemblage is expected only at the anchor and buoy, and, as a result, effects on finfish and invertebrate populations and EFH are expected to be negligible because a total of eight met buoys would be installed across all WEAs. As discussed in **Section 3.4.2**, impacts from removal of met buoys are expected to be negligible on finfish and invertebrate populations, and EFH.

BOEM may include mitigation measures resulting from the EFH consultation as appropriate for the project in the final lease. It should be noted that BOEM has committed to sharing survey data and deployment plans directly with NMFS and via the recent requirement for the lessees to provide Agency communication plans so that information is shared directly with consulting agencies in a timely manner.

Biological surveys, primarily fishery surveys, would likely result in some direct mortality to finfish and invertebrates and could include impacts on ESA-listed species such as the Atlantic sturgeon. However, the dispersed nature of biological survey-related vessel traffic and the limited number of surveys (see **Appendix A:** Vessel Trips and Scenarios) reduces the potential for repeated disturbances (Baker and Howson 2021). Generally, methodologies employed in fisheries surveys include returning most of the animals back to the sea as quickly as possible. Nevertheless, sub-sampling and other trauma is expected to result in some mortality. This mortality is anticipated to be undetectable within the overall fishery management regime described in **Section 3.3.3**. Although the overall impacts on finfish and invertebrates from biological surveys are anticipated to be negligible, BOEM recognizes that some fishery surveys could impact ESA-listed species. Gillnet sampling, in particular, poses a risk of injury or mortality to adult sturgeon (BOEM 2021c). Measures described in SOCs (**Section 4**) were developed to minimize the impacts of these surveys.

Impacts on finfish from vessel traffic associated with the Proposed Action are generally not expected to occur. Considering the limited number of vessels involved in the Proposed Action, the slow vessel speeds, and the fact that these vessels would be spread out across a variety of port locations, impacts on the Atlantic sturgeon are expected to be negligible (Baker and Howson 2021).

Geotechnical and benthic sampling may impact HAPCs (**Figure 3-1**) in the immediate area sampled. BOEM estimates that approximately 1,004 geotechnical/benthic samples would be taken by the lessee for site characterization under Alternative B (see **Appendix A** for geotechnical sampling calculations). However, only a small number of geotechnical and benthic samples would be taken within inshore areas (including within HAPCs) associated with the potential transmission cable routes, and sampling would be subject to specific state permit conditions relative to the undetermined transmission cable route. As discussed in **Section 3.4.2**, the physical bottom-sampling footprint for each collection is dependent upon the sampling device used but, in general, is anticipated to be on the order of 0.1 to 10 m^2 per sample (BOEM 2014a; Fugro Marine GeoServices Inc. 2017). The impacts of the small footprint of the samples within the inshore area along potential transmission cable routes (including within HAPCs) are not expected to result in the loss of any ecosystem function. Impacts on HAPCs from geotechnical and benthic sampling are expected to be negligible. BOEM requested consultation with NMFS in 2021 for three Atlantic Renewable Energy Regions (North Atlantic Planning Area, Mid-Atlantic Planning Area, and South Atlantic Planning Area) and adjacent coastal waters over the next 10 years (i.e., June 2021—June 2031). On June 29, 2021, NMFS completed consultation pursuant to Section 7 of the ESA of 1973, as amended, concerning the effects of certain site assessment and site characterization activities to be carried out to support the siting of offshore wind energy development projects off the U.S. Atlantic Coast. The consultation does not consider the effects of any survey activities that have the potential to result in directed or incidental capture or collection of any ESA-listed species (i.e., trawl surveys or gillnet surveys).

Through the consultation process for the New York Bight Draft Environmental Assessment, NMFS provided recommendations related to potential impacts on inshore areas and conservation measures to minimize impacts on EFH (NMFS 2021b). Such recommendations included:

- Avoid destructive sampling of important estuarine and inshore habitats including subtidal and intertidal flats, SAV, shellfish reefs and beds, and tidal marshes;
- Coordinate directly with NMFS prior to planning and scheduling for any inshore or estuarine sampling;
- Conduct high-resolution, comprehensive (100 percent coverage) habitat mapping in any areas with potential bottom impacts (e.g., from anchors of met ocean buoys) and that results of these mapping efforts should be shared with NMFS for review (NMFS 2021b); and
- Avoid placing met buoy anchors and chains (inclusive of the chain sweep area) in areas with complex habitats, benthic features with pronounced vertical relief (e.g., sand waves, slopes of ridge, and trough complexes), areas with dense aggregations of biota (e.g., cerianthid beds, shellfish beds), or areas with particularly sensitive species (e.g., northern star coral, seawhips). Complex habitats are defined in NMFS's *Recommendations for Mapping Fish Habitat* (NMFS 2021c).

Non-Routine Events

Similar to **Section 3.4.2**, the recovery of lost survey equipment could potentially have impacts on finfish and invertebrate populations and EFH. The extent of impacts would depend on the type of lost equipment and if the equipment can be recovered. The size of the lost equipment and/or the replacement cost would dictate the number of attempts made at recovery, affecting the size of the resultant impact area and the time spent searching. Additionally, the location of the lost equipment could affect the impact on other resources. When equipment is not able to be retrieved, bottom disturbance may occur from cutting/capping activities or from the equipment itself as it is carried away by currents. As described in **Section 3.4.1**, the impacts on finfish and invertebrate populations, and EFH resulting from the recovery of lost equipment are expected to be negligible.

Conclusion

Impacts from site characterization on finfish and shellfish populations and EFH in the WEAs are expected to be **negligible**. Impacts from site assessment activities on finfish and shellfish populations and EFH in the WEAs, are expected to range from **negligible** to **minor** depending on the activity. Primary impacts on this resource are disturbance related, and no population-level effects are anticipated.

Cumulative Impacts: The incremental impacts under the Proposed Action resulting from individual IPFs would range from negligible to minor for finfish, invertebrates, and EFH. BOEM anticipates that the cumulative impacts associated with the Proposed Action and with ongoing and reasonably foreseeable planned actions would be **moderate** for finfish, invertebrates, and EFH in the geographic analysis area, because a notable and measurable adverse impact is anticipated, but most resources would likely recover when the impacting agents were gone and remedial or mitigating actions were taken. The main impact drivers were analyzed under the No Action Alternative and stem from bottom-tending fishing gear, construction-related noise, and placement of offshore structures related to planned wind projects.

3.4.4 Marine Mammals

Factors that could potentially have an impact on marine mammals from the Proposed Action include acoustic effects from site characterization surveys, vessels, and equipment noise; benthic habitat effects; and vessel strikes. Potential impacts on marine mammals during met buoy installation, operation, and decommissioning include associated vessel traffic, possible entanglement in the mooring, and temporary disturbance of benthic habitat. BOEM has developed SOCs for lessees and operators, which are designed to prevent or reduce possible impacts on marine mammals during site characterization and site assessment activities (**Section 4**).

Impacts from site characterization have been analyzed in the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia EA and other relevant regulatory documents provided in **Table 2-1**. Despite regional differences in some of the assessments, the conclusions on impact levels are applicable to this EA, as there is substantial overlap in the species considered. The following conclusions for site characterization that were made in the previous analyses are expected to be the same for the Proposed Action:

- Impacts from HRG survey sound sources are expected to be **minor**. The Proposed Action involves neither low- or mid-range sonar (which in some cases has been associated with marine mammal stranding events [for example, see Frantzis (2003); Gordon et al. (2003)]) nor deep penetrating seismic surveys (which have been linked to behavioral responses among marine mammals more than 5 miles (8 km) away (see Gordon et al. (2003) for a review). Furthermore, mid- and low-frequency sonar and deep penetrating seismic surveys are not normally used for shallow hazard site assessment surveys such as those included in the Proposed Action and will not be authorized in a lessee's SAP where BOEM-recommended techniques will suffice (see BOEM (2024)). The acoustic signals from HRG survey equipment in the Proposed Action are within the hearing range for marine mammals and may cause Level B Harassment (i.e., behavioral disturbance as defined by the MMPA) but not hearing impairment. The June 29, 2021, programmatic ESA consultation with NMFS (Anderson 2021) determined that, with implementation of the BOEM project design criteria (PDCs), HRG surveys are not likely to adversely impact listed species of marine mammals. Consequently, the biological assessment for HRG surveys (Baker and Howson 2021) and associated concurrence letter from NMFS (Anderson 2021) are herein incorporated by reference.

  - New information has become available about the propagation of HRG sources since those referenced documents were published, and text provided in the remainder of this section reflects the updated information. The Level B threshold for marine mammals used in this analysis for HRG sources is an SPL of 160 decibels (dB) referenced to (re) 1 micropascal (μPa). This threshold is consistent with the previous analyses; however, recent information indicates the directionality of many of these sources can greatly influence the horizontal propagation of sound produced by these activities, which can reduce the distance from the source at which the potential for behavioral disturbance may occur (86 *FR* 22160; 86 *FR* 26465; 85 *FR* 21198). Although the distances may be smaller for some sources, the acoustic signals are still audible for marine mammals, and received levels may still exceed the Level B threshold; therefore, the conclusion remains the same. Detailed discussions on underwater sound and its importance to marine mammals and their hearing capabilities can be found in the Atlantic G&G Final PEIS and the previous Massachusetts Revised EA (**Table 2-1**), noting that the Atlantic G&G Final PEIS is only relevant here where it is addressing non-seismic effects of sound such as HRG surveys. Lease stipulations that have been developed for other projects will be used for the Proposed Action as appropriate (**Section 4**), and new stipulations will be developed if needed for compliance with best management practices identified in Anderson (2021) or revisions to the 2021 programmatic consultation and to ensure that marine mammals are not likely to be exposed to HRG survey noise above thresholds for Level B Harassment.

- Impacts from vessel and equipment noise, including geotechnical sampling (e.g., coring), are expected to be negligible to minor. The potential for adverse impacts under the June 29, 2021, programmatic ESA consultation with NMFS (Anderson 2021) determined that geotechnical surveys would have discountable impacts and are not likely to adversely impact listed species of marine mammals.

- Impacts from vessel traffic associated with site characterization are expected to be negligible. The vessel trips for site characterization and site assessment activities associated with the Proposed Action will result in an increase in vessel traffic from the routine activities that range from 201 to 377 round trips and would be spread out over the timeframe of the Proposed Action (**Appendix A**). The increase in vessel traffic relative to the Proposed Action is discountable relative to the existing vessel traffic within the WEAs (**Section 3.3.5**). Vessel separation distances and vessel strike avoidance procedures for marine mammals from the June 29, 2021, programmatic consultation (Anderson 2021) will be used as appropriate. These would include PDCs and SOCs (**Section 4**). Also, new stipulations could be developed if needed for specific projects proposed in the WEAs. With the implementation of PDCs for vessel operations, the likelihood of a vessel strike is expected to be extremely low (Baker and Howson 2021); however, if a vessel strike does occur, impacts could be significant (i.e., if an NARW was struck resulting in mortality).

The predominant source of noise during site characterization activities that could affect marine mammals would be HRG survey activities. However, the potential for impacts is not equal among HRG equipment. Multibeam echosounder and side-scan sonar typically used during site characterization surveys operate at frequencies over 180 kHz, which is outside the general hearing range of marine mammals likely to occur in the Central Atlantic and not likely to affect these species. BOEM acknowledges that some commercially available multibeam echosounders and side-scan sonars can operate at frequencies below 180 kHz; however, no surveys completed thus far on existing offshore wind leases have used this equipment. Also, the resolution provided from lower frequencies would not likely meet BOEM guidelines for geophysical data collection pursuant to requirements at 30 CFR §585.610–585.611 and 30 CFR §585.626(a) (BOEM 2024), and use of non-standard equipment is unlikely. Parametric sub-bottom profilers (SBPs) operate below 180 kHz, but no impacts are expected to occur during operation of these sources due to the narrow beamwidth (< 5°, which significantly reduces the impact range of the source) and rapid attenuation of the higher frequencies (≥ 85 kHz) in sea water.

Ultra-short baseline (USBL) positioning systems are also unlikely to affect marine mammals. Though they operate under 180 kHz, they have a wide variety of configurations, source levels, and beamwidths and have been shown to produce extremely small acoustic propagation distances in their typical operating configuration (AECOM Technical Services Inc. and HDR Inc. 2020; CSA Ocean Sciences Inc. 2020; Vineyard Wind LLC and Jasco Applied Sciences (USA) Inc. 2020). Additionally, NMFS's analyses of geophysical work for ITAs in the U.S. Atlantic have indicated that no Level A or B exposures are likely to result from the use of parametric SBPs or USBLs (86 *FR* 18943, 86 *FR* 26465, 86 *FR* 11930). Therefore, only mediumpenetration SBPs (e.g., sparkers, boomers) and shallow-penetration, non-parametric SBPs (e.g., CHIRPs) were considered in this assessment.

Impacts from underwater noise in marine mammals may include Level A Harassment (i.e., PTS], generally considered a type of injury) or Level B Harassment (i.e., behavioral disturbance) as defined by the MMPA. Studies indicate that the onset of hearing impacts is correlated with the zero-to-peak sound pressure level (PK) and sound exposure level (SEL), which account for the intensity of the sound and duration of exposure required to elicit hearing impacts in marine mammals. The potential for impact also depends on the type of sound (impulsive; non-impulsive, continuous; and non-impulsive, intermittent). Therefore, the assessment of PTS in marine mammals in this EA is based on the NMFS (2020b) acoustic guidance, which provides acoustic threshold criteria for the onset of PTS in five marine mammal hearing groups for both impulsive (e.g., sparkers/boomers) and non-impulsive (e.g., CHIRPs) sound types (**Table 3-2**). No otariid pinnipeds are expected to occur in the Central Atlantic, so this hearing group was not included in the assessment. These criteria represent the most recent guidance from NMFS.

Table 3-2. Threshold criteria for the onset of permanent threshold shift in marine mammals

Hearing Group		Impulsive Sound	Non-impulsive Sound
Low-frequency (LF) cetaceans	PK	219 dB re 1 µPa	N/A
	SEL_{24h}	183 dB re 1 µPa^2 s	199 dB re 1 µPa^2 s
Mid-frequency (MF) cetaceans	PK	230 dB re 1 µPa	N/A
	SEL_{24h}	185 dB re 1 µPa^2 s	198 dB re 1 µPa^2 s
High-frequency (HF) cetaceans	PK	202 dB re 1 µPa	N/A
	SEL_{24h}	155 dB re 1 µPa^2 s	173 dB re 1 µPa^2 s
Phocid pinnipeds (PW)	PK	218 dB re 1 µPa	N/A
	SEL_{24h}	185 dB re 1 µPa^2 s	201 dB re 1 µPa^2 s

Source: NMFS (2020b)
µPa = micropascal; dB = decibel; N/A = not applicable; PK = zero-to-peak sound pressure level, the maximum absolute value of the amplitude of a pressure time series; re = referenced to; SEL_{24h} = sound exposure level over 24 hours, a measure of the total sound energy of an event or multiple events over 24 hours.

Currently, the Level B thresholds recommended by NMFS in 2012 are provided as unweighted SPL to assess behavioral impacts (NOAA Fisheries 2021d). Although these criteria do not differentiate between marine mammal hearing groups like the PTS thresholds, they do differentiate between the types of sound sources and are applied as follows:

- SPL 120 dB re 1 µPa for the potential onset of behavioral disturbance from a *non-impulsive*, *continuous* source of sound (e.g., vessel noise, geotechnical coring).
- SPL 160 dB re 1 µPa for the potential onset of behavioral disturbance from an *impulsive* or *non-impulsive, intermittent* source (e.g., HRG surveys).

Behavioral reactions are expected to occur over a wide spectrum of variable responses, depending on the species and source type.

Vessel sound is characterized as low frequency, typically below 1,000 Hz, with peak frequencies between 10 and 50 Hz; non-impulsive rather than impulsive like impact pile driving; and continuous, meaning there are no substantial pauses in the sounds that vessels produce. Noise levels vary based on the type of vessel (BOEM, 2023f), but generally underwater source levels can range from 177 to 200 dB re 1 µPa at 1 m for large vessels and barges (Erbe et al. 2019; McKenna et al. 2012) and between 150 and 180 dB re 1 µPa at 1 m for smaller crew vessels (Kipple and Gabriele 2003, 2004). Parsons et al. (2021) reviewed literature for the source levels and spectral content of vessels fewer than 82 feet (25 meters) in length, a category often not addressed in vessel noise assessment measurements, and found reported source levels in these smaller vessels to be highly variable (up to 20 dB difference); however, an increase in speed was consistently shown to increase source levels while vessels at slower speeds were shown to emit low-frequency acoustic energy (less than 100 Hz) that is often not characterized in broadband analyses of small vessel sources.

Effects from vessel noise during both site assessment and characterization activities would predominantly be behavioral responses and potential auditory masking. A detailed review of the effects of vessel noise on specific marine mammal groups is provided in Erbe et al. (2019), but a high-level summary of the potential effects is provided for this discussion. A comprehensive review of the literature (Erbe et al. 2019; Mikkelsen et al. 2019; Richardson et al. 1995; Sprogis et al. 2020; Williams et al. 2022) revealed that most of the reported adverse effects of vessel noise and presence are changes in behavior, although the specific behavioral changes vary widely across species. Physical behavioral responses include changes to dive patterns, disruptions to resting behavior, increases in swim velocities, and changes in respiration patterns (Finley et al. 1990; Mikkelsen et al. 2019; Nowacek et al. 2006; Sprogis et al. 2020; Williams et al. 2022). Behavioral disturbances that alter an animal's foraging behavior can have a direct effect on an animal's fitness, as has been observed in porpoises (Wisniewska et al. 2018) and killer whales (Holt et al. 2021) in response to vessel noise. Physical stress has also been demonstrated in baleen whales in response to low-frequency anthropogenic noise by Rolland et al. (2012).

Some marine mammals may change their acoustic behaviors in response to vessel noise, either due to a sense of alarm or in an attempt to avoid masking, by altering the frequency characteristics of their calls (Castellote et al. 2012; Lesage et al. 1999), changing the number of discrete calls produced in a given time period (Azzara et al. 2013; Buckstaff 2006; Guerra et al. 2014), or ceasing vocal activity completely (Finley et al. 1990; Tsujii et al. 2018). Some species may change the duration of vocalizations (Castellote et al. 2012) or increase call amplitude (Holt et al. 2009) to avoid acoustic masking from vessel noise.

The Proposed Action is unlikely to result in any long-term acoustic masking given the relatively low volume of vessels required for the site assessment and characterization activities compared to existing vessel traffic in the region (**Section 3.3.5**) and the duration of the vessel transits under the Proposed Action. Additionally, although behavioral responses may occur in response to vessels transiting the Central Atlantic, these responses are unlikely to result in physiological effects due to stress responses or impacts on foraging, migrating, or mating behavior given the low volume of vessel traffic under the Proposed Action and relatively short duration (**Section 3.4.5**). Furthermore, the vessel speed reductions included in the SOCs would help lower the level of noise produced by project vessels (ZoBell et al. 2021). Overall, the behavioral disturbances that could result from exposure to vessel noise would not disrupt the normal routine function of marine mammals in the Central Atlantic and would therefore be **minor**.

Geotechnical surveys that employ coring equipment may produce non-impulsive, intermittent, low-frequency noise (less than 3 kHz) with a back-calculated source level, expressed as SPL, estimated to be 187 dB re 1 µPa at 1 m (Ruppel et al. 2022). This noise is within the hearing range of most marine mammals, and although the estimated source levels would exceed the behavioral disturbance threshold of 160 dB re 1 µPa, they would only be exceeded within approximately 65 feet (20 meters) of the source using spherical spreading loss equations. The 2021 NMFS Letter of Confirmation (LoC) concluded that noise associated with geotechnical surveys is below the level that we expect may result in physiological or behavioral responses by any ESA-listed species considered, and as such, effects to listed whales, sea turtles, or fish from exposure to this noise source are extremely unlikely to occur. Therefore, while geotechnical survey noise may be detectable, with SOCs in place it is unlikely to result in measurable behavioral effects for any marine mammal species, and potential impacts therefore would be **negligible**.

The proposed HRG surveys using the sub-bottom profiler and ultra-high-resolution seismic imaging equipment may produce noise levels within hearing frequencies and above regulatory hearing thresholds for some marine mammals (Crocker and Fratantonio 2016; Ruppel et al. 2022). The proposed sub-bottom profiler would be a parametric system with a highly directional beamwidth and operational frequencies between 30 and 115 kHz, which is classified as a non-impulsive, intermittent source. The ultra-high-resolution seismic imaging system has not been specified at this time, but it would fall under the impulsive source category with operational frequencies estimated to be less than 5 Hz.

In the Biological Assessment for Data Collection and Site Survey Activities for Renewable Energy on the Atlantic OCS (BOEM, 2021c), estimated distance to the behavioral threshold was a maximum of 1,640 feet (500 meters) for marine mammals during use of sparker systems operating at the highest power, which is expected to be louder than the sub-bottom profiler and ultra-high-resolution seismic imaging systems proposed for Proposed Action HRG surveys. Therefore, this represents a maximum potential area of effect that can be used to assess the risk of impacts on marine mammals from the Proposed Action. Although some geophysical sources can be detected by marine mammals and may exceed the thresholds, given several key physical characteristics of the sound sources, including source level, frequency range, duty cycle, and beamwidth, most HRG sources are unlikely to result in behavioral disturbance of marine mammals, even without mitigation (Ruppel et al. 2022). This finding is further supported by Kates Varghese et al. (2020), who found no change in three of four beaked whale foraging behavior metrics (i.e., number of foraging clicks, foraging event duration, click rate) in response to a 12-kHz multibeam echosounder; Vires (2011), who found no change in Blainville's beaked whale click durations before, during, and after a scientific survey with a 38-kHz EK-60 echosounder; and Quick et al. (2016), who found that short-finned pilot whales did not change foraging behavior but did increase their heading variance during use of an EK-60 echosounder. Conversely, Cholewiak et al. (2017) found a decrease in beaked whale echolocation click detections during use of an EK-60 echosounder. Given these reports with the proposed equipment types and short duration of the HRG surveys, prolonged disruptions to foraging or mating behavior are not expected. Considering the small distances to the behavioral disturbance thresholds, impacts would not disrupt the normal or routine functions of marine mammals and would therefore be minor.

However, BOEM regulations require that, if there is reason to believe that marine mammals may be incidentally taken as a result of a lessee's Proposed Action, the lessee must apply for an ITA under the MMPA and adhere to the requirements of the authorization (30 CFR §585.801(e)). Exact numbers of marine mammals affected by HRG surveys were not determined in this assessment as they will depend on the densities of animals within the location and time of year of proposed survey activities. But, as a part of the ITA process, if "takes" of marine mammals cannot be avoided, the developers would need to calculate the predicted amount of take to meet the small number requirement of the MMPA and ensure population-level effects are prevented. Given the low likelihood of PTS (injury) impacts without mitigation applied and the high likelihood of eliminating potential for PTS with mitigation, no permanent physiological impacts on marine mammals are expected. Impacts would likely be limited to behavioral disturbances, which would be temporary in nature. No changes are expected to result from noise produced by HRG survey activities that would permanently alter biologically significant behaviors (e.g., feeding, mating) or the viability of these populations. Based on the results of this assessment and the proposed mitigation measures, the risk of acoustic impacts on marine mammals from HRG surveys is likely to be minor.

Potential impacts on marine mammals include strikes from vessels used during site assessment and site characterization activities. BOEM anticipates that a range of 201 to 377 round trips of various vessel types may occur as a result of the activities covered in this EA. Vessel types, estimates of round trips by vessel type, and assumptions are described in **Appendix A**. Because the volume of commercial vessel traffic in the Central Atlantic is high (**Section 3.3.5**), it is unlikely that any site characterization and site assessment activities or vessels would measurably increase the risk of a strike between a marine mammal and vessels operating in the vicinity of the WEAs, including those involved in the Proposed Action. Considering BOEM's required implementation of the SOCs for HRG and geotechnical surveys (**Section 4**), any slight increase in vessel strike risk would be reduced to negligible levels. BOEM's SOCs were designed to minimize potential vessel strikes to marine mammals (**Section 4**). NMFS (2013) concluded that, during site characterization and site assessment activities, the potential for construction- and maintenance-related vessel strike to marine mammals is extremely low. Similarly, Baker and Howson (2021) concluded that the potential for effects on all listed species from vessel traffic associated with site characterization and site assessment activities are expected to be reduced to discountable levels with the implementation of the PDCs for vessel operations. Because of the low probability of such an event, potential impacts on marine mammals from vessel strikes resulting from site assessment activities are therefore expected to be negligible.

The potential for marine mammals to interact with a buoy and become entangled in the buoy or mooring system is extremely unlikely given the low probability of a marine mammal encountering a buoy or mooring system within the expanse of the WEA, and the high tension of the chain, which further reduces risk of entanglement (Anderson 2021; NMFS 2013). Potential impacts on marine mammals from met buoy operation and decommissioning are expected to be negligible because only one to two vessels would be utilized and for a short duration. During met buoy removal, disturbance of the sediment can cause elevated levels of turbidity, which may negatively affect prey items in a localized area. However, impacts would be of lower magnitude than those resulting from installation activities and are expected to be negligible. The installation and presence of met buoys and associated mooring chains would result in a temporary disturbance and a loss of benthic habitat over a very small area in the WEAs. Two met buoys within each lease of the WEA are unlikely to alter distribution of any forage species for marine mammals. The anchor and chain sweep for the buoy mooring is expected to denude a small area around the anchor, but the area of benthic habitat loss would be very small compared to the available habitat in the WEAs and is not expected to have a negative impact on foraging abilities for marine mammals. Potential impacts on marine mammals due to loss of habitat, changes to prey abundance (further discussed in **Section 3.5.3**), and distribution from installation of met buoys are expected to be **negligible**. As more information becomes available concerning any proposed project within the WEAs, BOEM will continue to reassess required mitigation measures for the proposed project.

Generally, benthic impacts from biological surveys (**Section 3.4.1**) are not expected to impact marine mammals. Additionally, the potential for marine mammals to interact with biological sampling gear and to become entangled is extremely unlikely given the dispersed nature of biological survey activities and the limited number of surveys (Baker and Howson 2021); impacts are expected to be **negligible**.

Non-Routine Events

The recovery of lost equipment could affect marine mammals through additional vessel traffic and noise and the potential impact from entanglement stemming from the dragging of grapnel lines. Traffic and noise associated with non-routine activities likely would be from a single vessel and therefore negligible. The extent of impacts from the grapnel lines would be dependent upon the type of lost equipment, which would dictate the number of attempts made at recovery. Regardless, the potential for marine mammals to interact with the grapnel line and to become entangled is extremely unlikely given the low probability of a marine mammal encountering the line within the expanse of the WEAs and transmission cable routes; therefore, impacts are expected to be negligible.

Conclusion

Impacts from site characterization and site assessment activities on marine mammals in the WEAs are expected to range from **negligible** to **minor** depending on the activity being conducted as effects would be notable, but the resource would be expected to recover completely without remedial or mitigating action. While it is possible for more significant impacts to occur (i.e., vessel strike, entanglement), the probability of such an occurrence is very low. Vessel strike and noise are two of the most important factors that may affect marine mammals. Implementing the vessel strike avoidance measures in the SOCs (**Section 4**) would minimize the potential for vessel strikes. BOEM's SOCs related to site characterization surveys and site assessment would minimize the potential for noise impacts on marine mammals.

BOEM will evaluate actual HRG survey equipment proposed for use when any future survey plan is submitted in support of any site characterization activities that may occur in the WEAs, and BOEM will continue to reevaluate the SOCs as new information becomes available.

Cumulative Impacts: The incremental impacts under the Proposed Action resulting from individual IPFs would range from negligible to minor for marine mammals, and impacts from ongoing and planned actions are expected to be several times greater than the incremental impacts of the Proposed Action alone. BOEM anticipates that the cumulative impacts associated with the Proposed Action and with ongoing and reasonably foreseeable planned actions as well as the environmental baseline would be **moderate** for marine mammals in the geographic analysis area because, though the impacts are unavoidable, the viability of the resource is not threatened, and affected marine mammals would recover completely when stressors are removed or remedial actions are taken. The main impact drivers stem from construction-related noise related to planned wind projects and increased vessel traffic associated with the Planned Action Scenario (**Appendix D**).

3.4.5 Military Use and Navigation/Vessel Traffic

Vessels associated with the Proposed Action could interact with military aircraft and military vessels during site characterization and site assessment activities. Potential use conflicts with military OPAREAs, danger zones, restricted areas, the USCG Weapons Training Area, and proposed tug and tow extension safety fairway are expected to be avoided by coordinating with military commanders and USCG prior to surveys; also, most conflicting areas were previously removed from consideration prior to identification of the Central Atlantic WEAs (BOEM 2021a). All authorizations for permitted site characterization and site assessment activities would include guidance for military coordination with the relevant agency. Vessel and aircraft operators would be required to establish and maintain early contact and coordination with the appropriate military command headquarters or point of contact. For areas that could not be removed from consideration, military activities have the potential to create temporary space-use conflicts on the OCS.

To avoid or minimize potential conflicts with existing DoD activities, site-specific stipulations may be necessary. Such stipulations would be identified during BOEM's future coordination with DoD if a lease is issued in these areas and a COP is submitted for approval. With implementation of DoD stipulations, impacts on military use are expected to be negligible.

Increased vessel traffic associated with site characterization surveys and the construction, operation, and decommissioning of a met buoy would be anticipated as a result of the Proposed Action. BOEM estimates that the number of vessel round trips from routine activities would range from 201 to 377 over a 5- to 7-year period (**Appendix A**). Vessel traffic anticipated as a result of the Proposed Action would add to the existing vessel traffic in the Central Atlantic (**Section 3.3.5**).

The additional vessel traffic associated with the Proposed Action increases the potential for interference with other marine uses in the area. However, the estimated number of round trips over a 5- to 7-year span is a relatively small amount of activity, and impacts can be minimized with proper scheduling and notification to the marine community. BOEM anticipates that the impacts of vessel traffic associated with the Proposed Action would be negligible.

The majority of the vessel traffic in the Central Atlantic is within TSS lanes, follows distinct patterns to approach/depart the TSS lanes, and is in a corridor parallel and close to the New Jersey coast (BOEM 2021a). The WEAs are not within designated routing measures, such as a TSS, and are also not within 1 nm from the edge of an adjacent TSS; therefore, any installed met buoys are not likely to pose an obstruction to navigation, and impacts on navigation are expected to be negligible. As currently proposed in the USCG Advanced Notice of Proposed Rulemaking (85 *FR* 37034; June 19, 2020), a tow-tug extension lane would overlap three of the WEAs (Hudson North, Fairways South, and Fairways North) as shown in **Figure 3-2**. There is the potential for conflict with the proposed tow-tug extension lane and site characterization activities, such as the installation of met buoys and slow-moving survey vessels with limited maneuverability. The impacts on navigation for these three WEAs should be re-evaluated when the USCG finalizes its rulemakings, because there is the potential that impacts on navigation could be greater than negligible.

Non-Routine Events

Similar to **Section 3.4.2**, the recovery of lost survey equipment could potentially have impacts on military use and navigation/vessel traffic through temporary space-use conflicts. The extent of impacts would depend on the type of lost equipment. The size of the lost equipment and/or the replacement cost would dictate the number of attempts made at recovery. The number of recovery attempts could affect the size of the resultant impact area and the time spent searching. Additionally, the location of the lost equipment could affect the impact on other resources. Regardless, the potential for recovery operations to interact with military use activities or vessel traffic is unlikely, given that recovery operations would likely involve one vessel for a short period of time; therefore, impacts are expected to be negligible.

Conclusion

Because site-specific coordination would be required to minimize multiple-use conflicts on the OCS in and around the WEAs, impacts on military use from the placement of met buoys are expected to be **negligible**. BOEM anticipates that impacts on navigation and vessel traffic from site characterization and site assessment activities are expected to be **negligible**. Because the vessel activity associated with the Proposed Action is expected to be relatively small compared to existing vessel traffic at the ports, in the

WEAs, and between the shore and the WEAs, impacts on navigation from the additional vessels are expected to be negligible over the 5- to 7-year span of activities. With the use of navigation aids, and because the WEAs were designed to avoid the major shipping lanes, impacts on navigation from the placement of a maximum of eight met buoys across the WEAs are expected to be negligible. The overall effect would be small, and the resource would be expected to return to a condition with no measurable effects without any mitigation.

Cumulative Impacts: The incremental impacts under the Proposed Action resulting from individual IPFs would range from negligible to minor for military use and navigation/vessel traffic. BOEM anticipates that the cumulative impacts associated with the Proposed Action and with ongoing and reasonably foreseeable planned actions would be **minor** for military use and navigation/vessel traffic in the geographic analysis area, because mitigation and coordination would avoid adverse impacts on the military- and traffic-related activities. Additionally, military use and navigation/vessel traffic are not expected to be disrupted from routine functions and activities in the geographic analysis area. The main impact drivers stem from construction of offshore structures related to planned wind projects resulting in increased navigational complexity and associated risks.

3.4.6 Sea Turtles

In addition to the EA documents provided in **Table 2-1**, impacts from site characterization have been analyzed in the NMFS Biological Opinion (Anderson 2021; NMFS 2013). Despite regional differences in some of the assessments, the conclusions on impact levels are applicable to this EA, as there is substantial overlap in the species considered. No critical habitat for sea turtles is designated in the WEAs. The following conclusions for site characterization that were made in the previous analyses are expected to be the same for the Proposed Action:

- Impacts from HRG active acoustic sound sources are expected to be minor. Available data suggests that sea turtle hearing is less sensitive than that of marine mammals and is thought to be more comparable to fish hearing (Finneran et al. 2017; Popper et al. 2014). This finding indicates that, though noise produced by HRG survey equipment, vessels, and equipment may be audible to sea turtles, it is unlikely to result in any long-term, population-level impacts (Anderson 2021; Baker and Howson 2021; NSF and USGS 2011). Acoustic signals from boomers and sparkers are the only HRG equipment that operate within the hearing range of sea turtles and may be audible to sea turtles. The potential for PTS and TTS is considered possible close to these active acoustic surveys, but impacts are unlikely as turtles would be expected to avoid such exposure and survey vessels would pass relatively quickly (Baker and Howson 2021; NSF and USGS 2011). As such, BOEM would require a lessee to implement SOCs to minimize acoustic impacts (**Section 4**), and new stipulations will be developed if needed for compliance with best management practices identified in Anderson (2021).
- Impacts from vessel and equipment noise, including geotechnical sampling (e.g., coring), are expected to be negligible to minor. BOEM assessed the impact level on the basis that vessel and equipment source levels could be high enough to exceed the threshold criteria for behavioral disturbance, and undetected sea turtles may occur in the ensonified area during sampling (Baker and Howson 2021; NSF and USGS 2011). BOEM would require a lessee to implement a

clearance zone for sea turtles prior to commencing surveys (**Section 4**), and new stipulations could be developed if needed for the Proposed Action.

- Impacts from vessel traffic resulting from the Proposed Action are expected to be negligible because SOCs require that all vessel operators and crew maintain a vigilant watch for sea turtles and implement BOEM PDCs developed under the June 29, 2021, programmatic consultation (Anderson 2021). In general, lease stipulations that have been developed for other projects would be used as appropriate (**Section 4**), and new stipulations could be developed if needed for the Proposed Action.

Impacts on sea turtles are briefly summarized here. The impacts on sea turtles from routine activities include vessel traffic associated with surveys and the installation, operation, and decommissioning of met buoys.

Sea turtles have potential to be struck by vessels resulting from activities under the Proposed Action. Because of their limited swimming abilities, hatchlings may be more susceptible than juveniles or adults to vessel strikes. The likelihood of strike would vary depending upon sea turtle species and life stage, and the location, speed, and visibility of the vessel.

The WEAs are adjacent to major shipping lanes. The number of annual trips from site characterization and site assessment activities represents a fraction of the vessel trips occurring in nearby ports each year (**Section 3.3.5**). A high risk of vessel strikes from the Proposed Action is not anticipated because the number of vessel trips is relatively low, and high densities of sea turtles are not expected to be concentrated in the vicinity of the WEAs (Shoop and Kenney 1992). The area is considered a low-density habitat because the WEAs are not offshore of nesting beaches, biologically important foraging areas, critical habitat, or migratory areas in which sea turtles may occur in high densities at certain times of year.

In addition to the low risk of strikes, survey and work vessels generally travel at slow operational speeds (typically 4 to 6 knots), further reducing the risk of a turtle strike by allowing vessel captains to spot sea turtles and allowing a greater reaction time for sea turtles to avoid an approaching vessel. Lessees will be required to follow the vessel strike avoidance SOC (Anderson 2021; **Section 4**). The NMFS LoC indicated that all vessels carrying out survey activities, including during transits, will comply with vessel PDC strike avoidance measures and impact avoidance measures regardless of the equipment used or the sound levels/frequency at which equipment is operating. The risk of a vessel strike with any species of sea turtles is minimal considering the low number of vessel trips from the Proposed Action relative to existing vessel traffic in the region, that the trips would be spread out over a 5- to 7-year period, and vessel strike avoidance requirements. Potential impacts on sea turtles from vessel traffic associated with site characterization and site assessment activities are expected to be negligible.

The installation and presence of met buoys and associated mooring chains would result in a temporary disturbance and a loss of benthic habitat over a very small area in the WEAs. Two met buoys within each lease of the WEA are unlikely to alter distribution of any forage species or appreciably alter the available foraging habitat for sea turtles (Baker and Howson 2021). Potential impacts on sea turtles due to loss of habitat, changes to prey abundance, and distribution from installation of met buoys are expected to be negligible.

Potential impacts on sea turtles during met buoy operation and decommissioning include associated vessel traffic for routine maintenance, possible entanglement in moorings, and disturbance of sediments from buoy removal. An increase in vessel traffic may cause an increase in sea turtle strikes or boat-related injuries, behavioral changes, or displacement from the area (Anderson 2021; NMFS 2013). However, considering the small number of vessels associated with the operation and decommissioning activities and with the implementation of the vessel strike avoidance measures required by the SOCs (**Section 4**), the potential for maintenance-related vessels to strike sea turtles would be extremely low. The potential for sea turtles to interact with a buoy and to become entangled in the buoy or mooring system is extremely unlikely given the low probability of a sea turtle encountering a buoy or mooring system within the expanse of the WEAs and the high tension of the chain, which further reduces risk of entanglement (Anderson 2021; NMFS 2013). Therefore, potential impacts on sea turtles from met buoy operation and decommissioning are expected to be negligible. During met buoy removal, disturbance of the sediment can cause elevated levels of turbidity that may negatively affect foraging sea turtles. However, impacts would be temporary, confined to a small area, and of lower magnitude than those resulting from installation activities; therefore, impacts are expected to be negligible.

Benthic impacts from biological surveys (**Section 3.4.1**) could affect prey items of sea turtles and may alter the diet composition of these ESA-listed species. However, because the amount of benthic habitat affected by the survey activities would be temporary and extremely small relative to the available foraging habitat in the region, any effects on listed species resulting from benthic disturbance would be negligible. Additionally, the potential for sea turtles to interact with biological sampling gear and to become entangled would be extremely low, given the dispersed nature of biological survey activities and the limited number of surveys; therefore, impacts are expected to be negligible.

Non-Routine Events

The recovery of lost equipment could affect sea turtles through additional vessel traffic and noise and entanglement risk related to the dragging of grapnel lines. Traffic and noise associated with non-routine activities would likely be from a single vessel and therefore be negligible. The extent of impacts from the grapnel lines would be dependent upon the type of lost equipment, which would dictate the number of attempts made at recovery. The potential for sea turtles to interact with the grapnel line and to become entangled is extremely low given the low probability of a sea turtle encountering the line within the expanse of the WEAs and transmission cable routes; therefore, impacts are expected to be negligible.

Conclusion

Impacts on sea turtles from site assessment activities are expected to be **negligible**. Impacts on sea turtles from site characterization activities are expected to range from **negligible** to **minor** depending on the activity being conducted; effects could be notable, but the resource would be expected to recover completely without remedial or mitigating action. Vessel strike and noise are two of the most important factors that may affect sea turtles. However, SOCs (**Section 4**) would minimize the potential for vessel strikes and adverse impacts on sea turtles.

Cumulative Impacts: The incremental impacts under the Proposed Action resulting from individual IPFs would range from negligible to minor for sea turtles. BOEM anticipates that the cumulative impacts associated with the Proposed Action and with ongoing and reasonably foreseeable planned actions would be **moderate** for sea turtles in the geographic analysis area, because impacts are unavoidable, but the viability of the resource is not threatened, and affected sea turtles would recover completely when stressors are removed or remedial actions are taken. The main impact drivers stem from construction-related noise related to planned wind projects and increased vessel traffic associated with the Planned Action Scenario (**Appendix D**).

4 Standard Operating Conditions

The Proposed Action includes SOCs to reduce or eliminate potential risks to or conflicts with specific environmental resources. If leases or grants are issued, BOEM will require the lessee to comply with the SOCs through lease stipulations and/or as conditions of SAP approval. The lessee's SAP must contain a description of environmental protection features or measures that the lessee will use.

For offshore cultural resources and biologically sensitive habitats, BOEM's primary mitigation strategy has been and will continue to be avoidance. For example, the exact location of met buoys would be adjusted to avoid adverse effects on offshore cultural resources or biologically sensitive habitats, if present. After lease issuance, the lessee would conduct surveys in accordance with the SAP including within the vicinity of the buoy deployments. Should these surveys reveal sensitive/complex habitat, BOEM would request locating/micrositing the anchors/moorings away from those features.

Utilizing the best available science and in consultation with NMFS (the agency primarily responsible for overseeing marine protected species conservation and recovery), BOEM has devised a protective suite of balanced SOCs to minimize the effects of site characterization and site assessment activities associated with offshore wind leasing. Specifically, these conditions are part of the Proposed Action (Alternative B) in order to mitigate, minimize, or eliminate impacts on protected species of marine mammals, sea turtles, fish, and birds listed as threatened or endangered under the ESA and MMPA. The proposed SOCs include requirements for geophysical survey shutdown zone monitoring, survey equipment powerup, and post-shutdown protocols for all ESA-listed species, in addition to any applicable ITA requirements under the MMPA for marine mammals. The SOCs for threatened and endangered species would be described in Addendum C of each proposed Commercial Lease;[8] and are described in the NMFS ESA consultation concurrence letter (Anderson 2021);[9] and the Data Collection Biological Assessment (Baker and Howson 2021).[10] These SOCs were developed through the analyses presented in Baker and Howson (2021) and through consultation with other Federal and state agencies.

Some biological surveys may also impact ESA-listed species. Because details on the type of biological survey, timing, and location are essential for understanding the potential impacts, BOEM is proposing to prohibit lessees from conducting fisheries surveys until BOEM has reviewed the proposed fisheries survey plan and notified the lessee that all necessary ESA Section 7 consultations addressing the proposed fishery survey have concluded.

For non-ESA-listed marine mammals, it is anticipated that NMFS project-specific mitigation would be required under any applicable ITAs. If an ITA is not obtained, SOCs for non-ESA-listed marine mammals include powering up survey equipment and providing a 328-foot (100-meter) clearance zone, which must be clear of all small cetaceans and seals for 15 minutes, and clear of humpback whales, Kogia, and beaked whales for 30 minutes. If any non-ESA-listed marine mammal is observed within the clearance zone during the monitoring period, the clock must be paused for 15 or 30 minutes, depending on the species sighted. If the protected species observer (PSO) confirms that the animal has exited the

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[8] Available at www.boem.gov/renewable-energy/state-activities/new-york-bight.
[9] Available at www.boem.gov/sites/default/files/documents/renewable-energy/Final-NLAA-OSW-Programmatic_0.pdf.
[10] Available at www.boem.gov/sites/default/files/documents/renewable-energy/OREP-Data-Collection-BA-Final.pdf.

shutdown zone and is headed away from the survey vessel, the clock that was paused may resume. The clock resets to 15 minutes for small cetaceans and seals, or to 30 minutes for humpback whales, Kogia, and beaked whales if an observed marine mammal dives and is not resighted by the PSO. Following pre-clearance and commencement of equipment operation, any time any marine mammal is sighted by a PSO within the applicable shutdown zone, the PSO must immediately notify the resident engineer or other authorized individual, who must shut down the survey equipment. Geophysical survey equipment may be allowed to continue operating if small cetaceans or seals voluntarily approach the vessel to bow ride, as determined by the PSO on duty, when the sound sources are at full operating power. Following a shutdown, the survey equipment may resume operating immediately only if visual monitoring of the shutdown zone continues throughout the shutdown, the animals causing the shutdown were visually followed and confirmed by PSOs to be outside of shutdown zone and heading away from the vessel, and the shutdown zone remains clear of all protected species.

Additional conditions and/or revisions to these conditions may be developed for incorporation into lease stipulations and/or as conditions of SAP approvals as new information becomes available or as may be required through any MMPA ITAs applied for by project proponents.

More specific information on the SOCs is available in **Appendix H**. Appendix H lists the SOCs that are part of the Proposed Action. The SOCs to minimize or eliminate potential impacts on protected species, including ESA-listed species of marine mammals and sea turtles, were developed by BOEM and refined during consultations with NMFS and USFWS under Section 7 of the ESA.

5 Consultation and Coordination

This section discusses public involvement and consultations in the preparation of this EA, including a summary of public scoping comments and formal consultations.

5.1 Public Involvement

5.1.1 Central Atlantic – Ocean User and Stakeholder, and Renewable Energy Task Force Meetings

On December 8, 2021, a Maritime Industry Stakeholder meeting was held. The meeting aimed to discuss the leasing process and the proposed Central Atlantic Renewable Energy Planning Area for offshore wind development in Delaware, Maryland, Virginia, and North Carolina. BOEM emphasized its commitment to transparency, collaboration, and early stakeholder engagement. Attendees included maritime industry representatives and other stakeholders. The meeting featured presentations on the renewable energy development process and the draft planning area, focusing on vessel traffic and navigational considerations. The USCG presented proposed navigational corridors and fairways. Participants expressed support for offshore wind development but raised concerns about vessel data, growth projections, fairways, navigation lanes, and coordination with the USCG. BOEM committed to working closely with the USCG and stakeholders to address these concerns and build an interactive mapping tool for data transparency.

A meeting with Environmental NGOs was held on December 15, 2021. The meeting had a dual purpose: to inform and gather feedback from members of the environmental and scientific communities regarding the proposed Central Atlantic Renewable Energy Planning Area for offshore wind development along the coasts of Delaware, Maryland, Virginia, and North Carolina. BOEM representatives emphasized their commitment to transparency, stakeholder collaboration, and science-based decision-making in addressing the climate crisis. Presentations covered various aspects of the project, including the Planning Area's boundaries; impacts on birds, marine mammals, and sea turtles; and analysis of fish habitats and fishing industry activities. Attendees raised concerns and questions about the potential impacts on wildlife, transmission lines, environmental impact analysis, public and stakeholder engagement, and the project's timeline. BOEM committed to considering these concerns and feedback as it moves forward with the project and expressed appreciation for the early engagement of environmental and scientific communities.

A series of sector-based Fisheries meetings were held on January 5, 2022, and January 6, 2022. The series of meetings was intended to provide information and answer questions about the BOEM leasing process and the proposed Central Atlantic Renewable Energy Planning Area for offshore wind development off the coast of Delaware, Maryland, Virginia, and North Carolina. Initial feedback and input were gathered from trap, pot, and fixed gear fishing communities, members of the trawl and mixed trawl fishing industry, recreational fishing stakeholders, and clam and scallop fishing stakeholders on the initial draft Central Atlantic Renewable Energy Planning Area.

A Renewable Energy Task Force meeting was held on February 16, 2022, with approximately 250 participants representing Federal and state agencies, Tribal Nations, local governments, industry, academia, and non-governmental organizations (NGOs). The meeting aimed to facilitate coordination, consultation, and information sharing among Federal, state, local, and Tribal governments regarding renewable energy leasing processes on the OCS in North Carolina, Virginia, Maryland, and Delaware. Discussions centered around the next steps in the offshore wind energy leasing process for the Central Atlantic states and sharing Task Force member feedback on the draft Call for Information and Nominations. Updates were received from various Task Force members, including individual states, Federal agencies, and Tribal governments. Attendees were provided with updates on the latest scientific information relevant to offshore wind and opportunities for stakeholder engagement. Opportunities were also created for public input on the topics being considered by the Task Force. BOEM conducted a Fishing Community and Related Industries Engagement meeting on November 30, 2022, to engage with the fishing community and related industries in the Central Atlantic region regarding the draft WEAs. The meeting aimed to share BOEM's plans and activities related to offshore wind development in the Central Atlantic, provide an opportunity for discussions with stakeholders, and inform participants on how to submit public input. BOEM representatives, including Karen Baker and Bridgette Duplantis, presented on the development of the draft WEAs, geospatial analysis, and the planning process. Participants from the fishing community raised questions and concerns about the potential impacts of offshore wind development on fishing activities, marine ecosystems, and habitat preservation.

An additional meeting was held with Environmental NGOs on December 1, 2022. The meeting aimed to share BOEM's plans for offshore wind development in the Central Atlantic, provide an opportunity for discussions, and inform participants on how to submit public input. BOEM representatives presented on the development of the draft WEAs, geospatial analysis, and the planning process. Participants from environmental organizations raised questions and concerns about potential impacts on wildlife, particularly right whales, and urged BOEM to consider exclusionary zones. They also emphasized the importance of addressing data gaps in bird monitoring and conducting more fisheries science. Some participants expressed support for offshore wind as a clean energy solution, while others called for careful consideration of environmental impacts.

A Renewable Energy Task Force meeting was held on October 10, 2023, to provide an update to Task Force members on activities since the February 2022 meeting, obtain feedback on the next steps in the offshore renewable energy process, discuss issues and concerns raised by Task Force members, stakeholders and the public, share information about ocean uses and biological and physical resources, and facilitate ongoing conversations and collaboration opportunities. The Final WEAs were discussed, as well as potential lease terms, stipulations, and economic conditions.

Full summaries of each meeting and associated presentations made at each meeting can be found at the relevant links here: https://www.boem.gov/renewable-energy/state-activities/central-atlantic-ocean-user-and-stakeholder-meetings and https://www.boem.gov/renewable-energy/state-activities/central-atlantic-tribal-and-renewable-energy-task-force-meetings.

5.1.2 Notice of Intent to Prepare an Environmental Assessment

On July 31, 2023, BOEM made an announcement regarding the finalization of three WEAs situated offshore in the states of Delaware, Maryland, and Virginia. This development came about after extensive engagement and feedback from a diverse array of stakeholders, including states, Tribes, local residents, ocean users, Federal government partners, and members of the public. BOEM initiated an environmental assessment process by publishing a Notice of Intent (NOI) in the *Federal Register* on August 1, 2023. The NOI signaled the commencement of a 30-day public comment period, providing an opportunity for interested parties to contribute their perspectives and insights. During the 30-day comment period, BOEM received 104 comments from a variety of stakeholders, including renewable and other businesses and associations; environmental and other public-interest groups; Federal, state, and local governmental entities; and the general public. Some commenters expressed general support or opposition, but most raised specific areas of interest and concern:

- Belief that offshore wind farms can be a source of green energy and that their construction and operation do not significantly impact tourism or property values.
- Concern that BOEM should conduct an EIS instead of an EA to evaluate impacts from leasing in the Central Atlantic and recommendations to expand the geographic scope.
- Concern for impacts on various species, with most concern for whales.
- Recommendations to expand the geographic scope of the EA to cover a broader area, enabling more efficient future lease sales and deconfliction efforts.
- Concern for the obstruction of scenic views, potentially affecting its tourism industry.
- Opposition to the wind farm, citing insufficient research and advocating for alternative land-based locations for such projects.

The comments can be viewed at www.regulations.gov by searching for docket ID **BOEM-2023-0034**.

5.1.3 Cooperating Agencies

As part of BOEM's announcement (88 *FR* 50170) for this Draft EA, BOEM invited Tribal governments and Federal, State, and local government agencies to consider becoming Cooperating Agencies in the preparation of this EA. CEQ regulations implementing the procedural provisions of NEPA define Cooperating Agencies as those with "jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative)" (40 CFR 1508.1(e)).

BOEM received Cooperating Agency requests from BSEE, NMFS, USACE, United States Environmental Protection Agency (USEPA), and the Town of Ocean City, Maryland. BOEM will provide potential Cooperating Agencies with a draft memorandum of understanding (MOU) that includes a schedule with critical action dates and milestones, mutual responsibilities, designated points of contact, and expectations for handling pre-decisional information.

5.2 Consultation and Coordination

5.2.1 ESA

Section 7(a)(2) of the ESA of 1973, as amended (16 U.S.C. §1531 et seq.), requires that each Federal agency ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of those species. When the action of a Federal agency may affect a protected species or its critical habitat, that agency is required to consult with either NMFS or USFWS, depending upon the protected species that may be affected. BOEM will initiate consultation with

USFWS/NMFS for activities considered in this EA and species under their respective jurisdictions. The status of consultations for each of the Services is described below.

USFWS

BOEM prepared a biological assessment to cover the species and critical habitat that may be affected by activities associated with the issuance of a lease and preparation of a SAP within the Central Atlantic. BOEM will submit the biological assessment to USFWS to request concurrence with BOEM's determination that the impacts of the proposed activities are expected to be discountable and insignificant and thus not likely to adversely affect ESA-listed bird species.

NMFS

The activities that may occur as a result of the issuance of leases in the Central Atlantic are subject to a programmatic consultation with NMFS (Anderson 2021; Baker and Howson 2021). BOEM plans to submit a literature review to NMFS.

5.2.2 Magnuson-Stevens Fishery Conservation and Management Act

Pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act of 1976, 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 Magnuson-Stevens Fishery Conservation and Management Act can be found at 50 CFR Part 600. BOEM plans to submit an EFH Assessment to NMFS that identifies potential adverse effects on designated EFH from activities described in the Proposed Action.

5.2.3 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 the state's federally approved coastal management program (15 CFR Part 930 Subpart C). BOEM prepared a Consistency Determination (CD) under 15 CFR 930.36(a) to determine whether issuing leases and site assessment activities (including the construction/installation, operation and maintenance, and decommissioning of met buoys) in the Central Atlantic WEAs were consistent to the maximum extent practicable with the provisions identified as enforceable by the Coastal Zone Management Programs of Delaware, Maryland, Virginia, and North Carolina.

BOEM prepared a CD for each state under 15 CFR 930.33 to determine whether issuing a lease for site assessment activities (including the installation, operation, and decommissioning of met buoys) in the WEAs is consistent with the enforceable policies of the Delaware, Maryland, Virginia, and North Carolina coastal zone management plans to the maximum extent practicable.

The EA provides the comprehensive data and information required under 30 CFR 939.39 to support BOEM's CD.

5.2.4 Tribal Coordination and Government-to-Government Consultations with Federally Recognized Tribal Nations

BOEM recognizes the unique legal relationship of the United States with Tribal Nations as set forth in the U.S. Constitution, treaties, statutes, Executive Orders, and court decisions. BOEM is required to consult with federally recognized Tribes if a BOEM action has Tribal implications, defined as any departmental regulation, rulemaking, policy, guidance, legislative proposal, grant funding formula changes, or operational activity that may have substantial direct effect on an Indian Tribe. In recognition of this special relationship, BOEM extended invitations to Tribal Nations for both government to government and Tribal Nation coordination meetings. Initially, this outreach included representatives from eight federally recognized Tribal Nations currently located on the Central Atlantic east coast, and BOEM has subsequently augmented this Tribal engagement to include a total of 23 federally recognized Tribal Nations with ancestral ties to the region.

BOEM held a Tribal Nation coordination meeting on December 9, 2021. The meeting's primary objective was to share information regarding BOEM Central Atlantic region's upcoming plans, activities, and schedules related to offshore renewable energy. The meeting took place via webinar on the Zoom platform and involved the participation of Tribal Nation representatives from the Chickahominy Indian Tribe-Eastern Division, Delaware Nation, Delaware Tribe of Indians, Eastern Band of Cherokee Indians, Nansemond Indian Nation, Pamunkey Indian Tribe, Rappahannock Tribe, and Shinnecock Indian Nation. The meeting provided a platform for Tribal Nation representatives to express their concerns and explore opportunities concerning offshore renewable energy activities in the Central Atlantic region. It aimed to facilitate information sharing between Central Atlantic Tribal Governments and BOEM. Another objective was to discuss Tribal Nation participation in the Central Atlantic Intergovernmental Renewable Energy Task Force, emphasizing the importance of Tribal Nation engagement in the decision-making process. The meeting also sought to establish and strengthen relationships between Tribal Nations and BOEM, recognizing the value of collaboration and dialogue.

During the listening session, Tribal Nation representatives posed questions and shared comments on various aspects of offshore wind development. Topics included the development of shallow and deep-water Planning Areas, inclusion of recently federally recognized Tribal Nations, concerns about ancestral territories near Virginia Beach, and potential impacts on cultural areas. Tribes expressed their interest in understanding how offshore wind development would affect onshore energy infrastructure and cultural sites. They also highlighted the need for preliminary assessments of historic and cultural landscapes before Section 106 reviews. BOEM acknowledged the challenges in understanding technical information and offered resources such as training sessions and expert consultations to help stakeholders navigate complex topics related to offshore wind energy.

A second Tribal Nation coordination meeting was held on December 5, 2022. This meeting was attended by representatives of the Chickahominy Indian Tribe-Eastern Division and Delaware Tribe of Indians. During that meeting, BOEM highlighted its role in offshore wind development and provided an overview of the Central Atlantic region, acknowledging potential conflicts within the draft WEAs and outlined the offshore wind planning and analysis process, including stakeholder feedback incorporation. In giving feedback, Tribes emphasized the importance of proactive engagement and support from BOEM in offshore wind processes, including collaboration with the offshore wind industry and funding for comprehensive studies. A suggestion was made for the offshore wind industry to provide benefits to

Tribal Nations based on project sales and profits. The need for upgraded hardware and software capabilities to participate effectively in map reviews and ethnographic research was also highlighted.

BOEM held a third Tribal Nation coordination meeting on September 6, 2023, to discuss the Central Atlantic Final WEAs, the EA, and the NHPA Section 106 consultation process. This meeting was attended by The Delaware Tribe of Indians and the Mashantucket (Western) Pequot Tribe. During the meeting, Tribes discussed the scope of studies conducted and considered by BOEM for the EA, potential for Tribal Nation funding or partnership through the leases, control and confidentiality of sensitive information pertaining to cultural resources, and consideration of the locations of WEAs in relation to ancient submerged cultural landscapes.

On August 11, 2023, BOEM invited the following 23 federally recognized Native American Tribes with ancestral ties to the region under consideration in the EA to participate in government to government consultation: Absentee-Shawnee Tribe of Indians of Oklahoma, Catawba Indian Nation, Chickahominy Indian Tribe, Chickahominy Indian Tribe-Eastern Division, Delaware Tribe of Indians, Eastern Band of Cherokee Indians, Eastern Shawnee Tribe of Oklahoma, Mashantucket (Western) Pequot Tribe, Mashpee Wampanoag Tribe, Mohegan Tribe of Connecticut, Nansemond Indian Nation, Pamunkey Indian Tribe, Rappahannock Tribe, Seminole Tribe of Florida, Shawnee Tribe, Stockbridge-Munsee Community Band of Mohican Indians, The Delaware Nation, The Narragansett Indian Tribe, The Shinnecock Indian Nation, Tuscarora Nation, Upper Mattaponi Indian Tribe, Wampanoag Tribe of Gay Head (Aquinnah), and United Keetoowah Band of Cherokee Indians.

5.2.5 National Historic Preservation Act (Section 106)

Section 106 of the NHPA (54 U.S.C. §306108) and its implementing regulations (36 CFR Part 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 issuing commercial leases within the Central Atlantic WEAs and granting ROWs and RUEs within the region constitutes an undertaking subject to Section 106 of the NHPA and its implementing regulations as the resulting site characterization and site assessment activities have the potential to cause effects on historic properties.

BOEM initiated consultation through letters on August 11, 2023, with the Delaware State Historic Preservation Office (SHPO), Maryland SHPO, Virginia SHPO, ACHP, and the aforementioned list of 23 federally recognized Native American Tribes. On August 30, 2023, the Shawnee Tribe responded to BOEM declining to participate in consultation. No additional federally recognized Tribes have responded to express interest in consulting with BOEM; however, BOEM has elected to keep the remaining 22 federally recognized Tribes informed of the Section 106 consultation process for this undertaking unless they respond to BOEM to opt-out.

BOEM further identified potential consulting parties pursuant to 36 CFR §800.3(f) through an August 11, 2023, letter to over 200 entities—including Federal and state agencies; local governments; state-recognized Tribes; and NGOs such as historical societies, museums, and historic preservation organizations—to notify and invite them to the Section 106 consultation, to solicit comment and input regarding the identification of, and potential effects on, historic properties for the purpose of obtaining consulting party review and input for the Section 106 review (36 CFR §800.2(d)(3)) and to invite the recipients to participate as a consulting party. BOEM prepared a Finding of No Historic Properties

Affected (Finding), consistent with 36 CFR §800.4(d)(1), which was provided to the consulting parties on December 12, 2023.

BOEM received concurrence on the Finding from the Delaware SHPO on [DATE], 2024, from the Maryland SHPO on December 27, 2023, and from the Virginia SHPO on [DATE], 2024. BOEM also received letters agreeing with the Finding from the consulting parties including the U.S. Navy History and Heritage Command on December 14, 2023, and the Virginia Department of Military Affairs on December 18, 2023. No other comments were received on the Finding. Per 40 CFR §800.4(d)(1)(i), "[i]f the SHPO/THPO [Tribal Historic Preservation Officer], or the Council if it has entered the Section 106 process, does not object within 30 days of receipt of an adequately documented finding, the agency official's responsibilities under Section 106 are fulfilled." The Finding is available on BOEM's website at www.boem.gov/renewable-energy/state-activities/mid-atlantic-wind-energy-areas.

5.2.6 Clean Water Act

The U.S. Army Corps of Engineers (USACE) Nationwide Permit (NWP) Program was developed to streamline the evaluation and approval process for certain types of activities that have only minimal impacts on the aquatic environment that require USACE permits for discharge of dredged or fill material under Section 404 of the Clean Water Act and/or for Section 10 of the Rivers and Harbors Act of 1899. Most site characterization and site assessment activities under the Proposed Action would be covered by USACE NWP Number 5 (*Scientific Measurement Devices*) and NWP Number 6 (*Survey Activities*). NWPs were developed to provide a streamlined evaluation and approval process for certain activities that have minimal adverse impact, both individually and collectively, on the environment. NWP Number 5 covers the placement of scientific measurement devices, including tide gauges, water recording devices, water quality testing and improvement devices, meteorological stations (which would include met buoys), and similar structures. NWP Number 6 covers a variety of survey activities, including 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. USACE indicated that site characterization and site assessment activities outlined in the EA that may require Corps authorization, such as met buoys, would likely qualify for USACE general permits. An individual permit may be required from USACE if the proposed survey activities do not meet the terms and conditions of the NWPs or if USACE determines that the survey activities would result in more than minimal adverse effects on the aquatic environment. Additionally, other Federal, state, and local permits, approvals, or authorizations may also be required. SAPs submitted by lessees would identify the specific activities proposed to be conducted and the permit requirements applicable to the proposed activities.

6 Preparers

Table 6-1. BOEM contributors

Name	Role/Resource Area
NEPA Coordinators	
Landers, Lisa	NEPA Compliance; Tribal Nation Coordination
Resource Scientists and Contributors	
Ajilore, Ololade	Navigation and Vessel Traffic
Beser, Todd (USACE)	Benthic
Bigger, David	Birds and Bats
Chaiken, Emma	Socioeconomics
Chaky, Sindey	Coastal Zone Management Act Compliance; Environmental Justice
Chen, Paulina	Document Editing and Production
Jensen, Brandon	Benthic; Finfish; Invertebrates; and Essential Fish Habitat
Jensen, Mark	Socioeconomics; Recreation and Tourism
McCarty, John	Recreation and Tourism
Oliver, Liz	Government to Government
Schnitzer, LK	Cultural Resources; Tribal Nation Coordination
Slayton, Ian	Air Quality
Stokely, Sarah	Cultural Resources
Stromberg, Jessica	Chief, Environment Branch for Renewable Energy; NEPA Compliance
Wisman, Jeri	Marine Mammals; Sea Turtles

Table 6-2. Consultants

Name	Role/Resource Area
ICF	
Baer, Sarah	Project Coordinator
Birnbaum, David	Section 106 and Cultural Resources Lead
Cox, Deneisha	Administrative Record Lead
Cherry, Jesse	Publications Specialist
Cherry, Ken	Technical Editor
Cross, Kateri	Biological Resources Support
Ernst, David	Air Quality Lead
Farge, Courtney	NEPA Support
Hallman, Ryan	Air Quality Support
Hartfelder, Kelsey	Air Quality Support
Hastings, Tatum	EndNote Support
Hatfield, Teresa	Military Use and Navigation/Vessel Traffic
Jablon, Rebecca	Project Manager
Johnson, Bruce	Biological Resources Support; U.S. Fish and Wildlife Service Biological Assessment
Jost, Rebecca	NEPA Support; Recreation and Tourism
Lanza, Robert	NEPA Task Lead
Loyall, Hunter	Benthic Resources; Commercial Fisheries and For Hire Recreational Fishing
Mahoney, Elisabeth	EndNote Lead
McCoy, Maureen	Section 106 and Cultural Resources Support
ODonnell, Megan	Biological Resources Lead; National Marine Fisheries Service Essential Fish Habitat Assessment and Literature Review; Finfish, Invertebrates, and Essential Fish Habitat; Marine Mammals; Sea Turtles
Pyle, Amy	Essential Fish Habitat Assessment Support
Read, Brent	GIS Lead
Wheaton, Jenna	Section 106 and Cultural Resources Support
Zedaker, Dylan	Section 106 and Cultural Resources Support

Appendix A: Vessel Trips and Scenarios

This appendix provides the Proposed Action scenario assessed in the Central Atlantic Environmental Assessment. **Tables A-1 through A-5** provide the estimated quantification of site characterization and site assessment survey effort and activities, including survey lengths in kilometers, estimated durations and vessel trips, and timing of some surveys.

Table A-1. Summary of high-resolution geophysical survey calculations

Location	Duration of Vessel Operation	Kilometers	Hours	Days	Months	Distance (km) Transited to/from Shore Monthly (24-hr vessel)	Vessel Trips
Grand Total Export Cable Routes	24-hr vessel 70%	17,507.00	2,100.67	87.53	2.92	1,032.83	3
	12-hr vessel 30%	7,503.00	900.29	75.02	2.50	N/A	76
Grand Total Wind Energy Areas	24-hr vessel 100%	64,259.58	7,710.53	321.27	10.71	3,791.01	11
Grand Combined Totals		**89,269.58**	**10,711.49**	**483.82**	**16.13**	**4,823.84**	**90**

hr = hour; km = kilometer; m = meter; WEA = Wind Energy Area

Assumptions:
Transit Speed = 18.52 km/hr (10 knots).
Survey Speed = 8.334 km/hr (4.5 knots).
Survey corridor for transmission lines are 1,000 m wide.
30-m line spacing for transmission corridor for archaeological surveys.
150-m line spacing for WEAs and transmission corridor for hazard surveys. Perpendicular tie-lines occur every 500 m.
Includes an 800-m buffer around each WEA to account for line turns, anchoring, or other activities that may occur beyond the WEA boundary.

Table A-2. Vessel trip calculations associated with benthic and geotechnical sampling

Samples per Day	Days	Trips
10 Geotechnical Samples per 24-Hour Day	324	11
20 Benthic Samples per 24-Hour Day	128	4

Assumptions:
Disturbance Areas (estimated maximum)

Standard van veen Benthic	0.1 m^2/sample
Other Benthic	1 m^2/sample
Sediment Profile Imaging	4 m^2/sample
Cone Penetration Test (CPT)	4 m^2/sample
Vibracore	3 m^2/sample
If Anchoring	10 m^2/sample

m^2 = square meters

Number of Samples

One geotechnical sample (vibracore, CPT, and/or deep boring) at every potential wind turbine location and transmission station location	628
One geotechnical sample (vibracore, CPT, and/or deep boring) every kilometer of transmission cable corridor	610
One benthic sample every kilometer of transmission cable corridor	610
One benthic sample at each buoy site	8
TOTAL	**1,856**

Table A-3. Vessel trip calculations associated with site assessment buoys

Installation					
Number of Leases	# Buoys	Round Trips for Construction per Buoy – Low	Total Round Trips – Low	Round Trips for Construction per Buoy – High	Total Round Trips – High
4	2	1	8	2	16

Maintenance – Quarterly/ Monthly				
Number of Leases	# Buoys	# Visits[1]	Years	Total Trips
4	2	2	5	80
4	2	6	5	240

[1] Each vessel trip is assumed to cover maintenance of two buoys.

Decommission					
Number of leases	# Buoys	Round Trips for Construction per Buoy – Low	Total Round Trips – Low	Round Trips for Construction per Buoy – High	Total Round Trips – High
4	2	1	8	2	16

Total		
Alternative	Low Range	High Range
A	201	377

Table A-4. Vessel trip calculations associated with fish surveys

Survey	Vessel Days
1. Trawl	40
2a. Gill net	48
2b. Beam trawl	24
3. Ventless trap	16
4. Molluscan shellfish	Concurrent with Benthic
TOTAL	128

Assumptions:

Based on June 2019: *Guidelines for Providing Information on Fisheries for Renewable Energy Development on the Atlantic Outer Continental Shelf.*

1. Otter Trawl Survey Protocols. Demersal Fish

- Trawl speed of 2.9–3.3 knots
- 2 years x 4 quarters = 8 surveys
- 30 trawls per survey = 240 samples (trawls)
- Vessel trips = 2 days travel round trip + 3 days on site = 5 days per survey
- 5 days/survey x 8 surveys = 40 vessel days

2. Gill Net and Beam Trawls Protocols. Microscale Distribution of Fish

a. Gill net:

- 2 years x 2 quarters (spring and fall) x 3 events/quarter = 12 surveys
- 6 samples per survey = 72 samples
- Vessel trips = 2 days round trip + 2 day (1–2 days) on site = 4 days per survey
- 4 days/survey x 12 surveys = 48 vessel days

b. Beam trawl (might be able to piggyback with trawl survey):

- 2 years x 4 quarters = 8 surveys
- 6 samples/survey = 48 samples
- Vessel trips = 2 days round trip + 1 day on site = 3 days per survey
- 3 days/survey × 8 surveys = 24 vessel days

3. Ventless Trap Survey

- 2 years x 4 quarters = 8 surveys
- 3 locations/survey = 24 samples (each sample consists of a 5-trap trawl)
- Vessel trips = 2 days round trip (day 1 travel and set, 3 days later day 2 travel and haul)
- 2 days/survey × 8 surveys = 16 vessel days

4. Molluscan Shellfish Survey

- Assume concurrent with benthic survey

Table A-5. Vessel trip calculations associated with marine mammal, sea turtle, and avian surveys

Vessel-Based Surveys	• Vessel speed = 10 knots • Round trip distance = 240 km • Marine mammal surveys 3 years x monthly = 36 surveys • Avian may be conducted in a minimum of 2 years
Aerial-Based Surveys	• Aircraft speed = 100 knots • Round trip distance = 240 km • Marine mammal surveys 3 years x monthly = 36 surveys • Avian may be conducted in a minimum of 2 years
PAM Surveys	• Assume concurrent with vessel-based surveys

km = kilometer

Assumptions:

Based on June 2020: *Guidelines for Providing Information on Marine Mammals and Sea Turtles for Renewable Energy Development on the Atlantic Outer Continental Shelf.*

Based on May 27, 2020: *Guidelines for Providing Avian Survey Information for Renewable Energy Development on the Outer Continental Shelf.*

Appendix B: Resources Eliminated from Detailed Consideration and Assessment of Resources with Negligible Impacts

B.1 Introduction

This appendix describes resources eliminated from detailed consideration and also provides an assessment of resources with negligible impacts from implementation of the Proposed Action. **Section 3.2** of the Environmental Assessment (EA) provides the impact level determinations used to characterize the environmental impacts.

B.2 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 Draft EA have been previously analyzed in the Atlantic Geological and Geophysical (G&G) Final Programmatic Environmental Impact Statement (PEIS), the Alternative Energy PEIS, and previous EAs (**Table 2-1**), the potential for impacts is well documented. The previous analyses provided in **Table 2-1** address the resource areas listed below in greater detail. Although not all of these previous documents specifically address the Central Atlantic area, the same types of activities described in this Draft EA are addressed in those documents. Additionally, activities included within the Proposed Action of this Draft EA do not include the installation of met towers. Although the analysis presented in previous EAs (e.g., *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia, Final Environmental Assessment* and *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina, Revised Environmental Assessment*) included met tower installation, this potential source of impact has been removed from the present analysis and may account for a reduced impact rating relative to prior assessments. The evaluations and conclusions in those documents are consistent with BOEM's determination that the resource areas outlined below will not be carried forward for analysis in this Draft EA because impacts on these resources are anticipated to be negligible. However, the resources listed here would be within the scope of analysis for future actions (i.e., development of a wind lease area).

Bats

The potential impacts on bats associated with activities described in the scenario for the Proposed Action (HRG surveys, geotechnical/benthic sampling, and biological surveys within the Central Atlantic) would be negligible. Impacts on bats are analyzed in detail within the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic OCS Offshore North Carolina, Revised EA* (BOEM 2015a). Bat activity in the Atlantic has been found to decline dramatically 11 nm) (20.4 kilometers [km]) from shore (Sjollema et al. 2014), and it is generally considered unlikely that any bats would travel 15 nm or more from land over open water to forage exclusively in the WEAs (Peterson 2016; Sjollema et al. 2014).

One species of bat federally listed as endangered,[11] the northern long-eared bat (*Myotis septentrionalis*), has a range that includes most of the coastal areas along the WEAs, with the notable exception of most of the Delmarva Peninsula, including all Maryland counties and most of Delaware (USFWS 2022). Unlike tree bats, which migrate long distances to warmer climates in the winter, northern long-eared bats do not migrate long distances, especially over open water. Instead, colonies of northern long-eared bats hibernate in caves for the winter, and individuals roost in trees during the summer so that they can forage primarily in wooded habitat within a kilometer of their roost (80 *Federal Register* [*FR*] 17974). Although passage of a migrating tree bat through any of the WEAs is considered a rare event (BOEM 2015a), migrating tree bats have been detected on the OCS. Additionally, given the rarity of the northern long-eared bat in the region, its ecology, and habitat requirements, it is extremely unlikely that any northern long-eared bats would venture so far from land and on to the OCS and into the WEAs (Pelletier et al. 2013; Peterson 2016).

Although bats are rare in the WEAs, bats could have avoidance or attraction responses to the survey vessels and met buoys due to noise, lighting, and the possible presence of insects. There may be temporary impacts on bats from onshore operational noise and human activity during construction and decommissioning or during survey operations of the offshore export cable route in coastal areas; these operations, however, will not be out of character for the areas existing vessel traffic and operations. Due to the scarcity of bats offshore in the WEAs, the limited amount of added vessel traffic (relative to existing traffic described in **Section 4.2.5**), and based on the approximately eight met buoys that would be installed at distances of 19 nm or more from shore, collisions between bats and boats/met buoys are unlikely. Thus, the overall impact of activities associated with the Proposed Action would be negligible.

Bathymetry, Geology, and Sediments

The potential impacts on bathymetry, geology, and sediments from activities described in the scenario for the Proposed Action (HRG surveys, geotechnical/benthic sampling, and biological surveys within the Central Atlantic) would be negligible. This analysis is consistent with the Atlantic G&G Final PEIS (BOEM 2014a). The installation of a met tower is not included as part of the Proposed Action analyzed within this Draft EA. Installation of a met buoy would result in greater impacts on the seafloor than disturbance from bottom sampling. Disturbance from installation of each met buoy would result in a maximum impact area of 34,398 m^2 (8.5 acres), with anchor chain sweep, per buoy. A total of 275,184 m^2 (68 acres) of seafloor could be affected, assuming the maximum number (eight) of met buoys are installed, that all buoys are either boat-shaped or discus-shaped, and that they disturb the maximum foreseeable area of seafloor. The dominant habitat type in the region is sand or soft bottom, and recovery of soft-bottom benthic environments takes a few months to a few years depending on the substrate composition (with sandy substrates recovering more quickly than silt/clay) (Brooks et al. 2006; Kritzer et al. 2016; Lindholm et al. 2004). Use of spar-type buoys would result in a maximum impact area of 944 m^2 (0.23 acres) assuming eight spar-buoys are deployed which would decrease the area of impact by 99% compared to using met buoys. ~~Thus, the installation of two met buoys per lease would create negligible impacts on the bathymetry, geology, and sediments of the seafloor. Impacts~~ from bottom-

[11] On November 30, 2022, USFWS published in the Federal Register (87 FR 73488) a final rule reclassifying the northern long-eared bat as an endangered species under the Endangered Species Act (16 U.S.C. 1531 et seq.). The rule became effective on January 30, 2023.

sampling range from 1 to 10 m^2 per sample (BOEM 2014a; Fugro Marine GeoServices Inc. 2017). BOEM estimates that approximately 1,624 samples would be collected (**Appendix A**). The maximum area of disturbance from bottom sampling would be about 68 acres assuming anchoring would be required for all samples, which is a highly unlikely scenario. BOEM does not anticipates that benthic sample collection would require anchoring. Additionally, the estimated area of disturbance from bottom sampling would be spread out across the leases within the WEAs and along the potential offshore export cable corridors. Therefore, collection of bottom samples would create negligible impacts on the bathymetry, geology, and sediments of the seafloor.

Birds

The potential impacts on birds associated with activities described in the scenario for the Proposed Action (HRG surveys, geotechnical/benthic sampling, and biological surveys within the Central Atlantic) would be negligible. The Atlantic Coast is a major flyway for birds, including terrestrial species, shorebirds, waterbirds, and marine birds. Three federally listed birds may be found within the WEAs: piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), and roseate tern (*Sterna dougallii dougallii*) (USFWS 2023). Bird species that are likely to occur in the WEAs are generally found in other nearshore areas of the Atlantic Ocean from North Carolina to Delaware and are described in detail within the previous EAs and the Atlantic G&G Final PEIS listed in **Table 2-1**. The previous NEPA documents evaluated impacts on birds that could occur as a result of similar activities to the Proposed Action. These impacts include the effects associated with light, noise (vessel, equipment, and HRG sound sources), vessel traffic, installation of met buoys, and non-routine events. In the previous analyses (**Table 2-1**), installation of met towers was considered the most significant IPF to birds; that activity has been removed from the Proposed Action for this EA. BOEM estimates that the number of vessel round trips from routine activities would range from 201 to 377 over a 5- to 7-year period (**Appendix A**).

Relative to existing vessel traffic in the Central Atlantic, the Proposed Action would introduce a small number of vessels over the timeframe of the Proposed Action. BOEM anticipates that a range of 201 to 377 round trips of various vessel types may occur as a result of the activities covered in this EA, and only a maximum of eight met buoys would be installed across the leases anticipated within the noncontiguous WEAs, resulting in negligible impacts on birds. Additionally, lessees would be required to abide by the SOCs for birds (**Section 4**) to reduce the potential for the Proposed Action to adversely affect this resource.

Coastal Habitats

Previous NEPA evaluations include descriptions of the affected environment for coastal habitats along the entire Atlantic Coast, including Delaware, Maryland, Virginia, and North Carolina (BOEM 2012; 2015a; MMS 2007b). The coastal resources of the Central Atlantic shorelines include sandy beaches, coarse-grained beaches, cliffs, shellfish beds in tidal flats, submerged aquatic vegetation (SAV) (seagrasses and attached macroalgae), coastal dune systems, barrier island forests, and salt and freshwater marshes. Impacts on SAV beds are addressed in **Sections 3.4.1** and **3.4.3**. The closest WEAs are located approximately 24.5 nm from Delaware, 18.9 nm from Maryland, 19.0 nm from Virginia, and 35.4 nm from North Carolina. Given the minimum distance from shore, vessel traffic from site characterization surveys and site assessment activities would have no direct impacts on coastal habitats. Nearshore vessel traffic and use of coastal facilities have the potential to affect coastal habitats in already heavily used port areas. Vessel traffic associated with the Proposed Action would be primarily from ports in Delaware, Maryland, and Virginia, and no expansion of these ports is expected in support of the Proposed Action. Specific ports used by a lessee in the future would be determined primarily by proximity to the WEAs and capacity to handle proposed activities. No direct impacts on coastal habitats are anticipated from routine activities associated with site characterization and site assessment, or from non-routine events under the Proposed Action. Indirect impacts from routine activities may include wake-induced erosion and increased turbidity caused by nearshore vessel traffic but would be negligible or less given the small amount of added vessel traffic to existing traffic in the area.

Coastal Infrastructure

Vessel and crew usage of onshore facilities associated with site characterization and site assessment activities have been analyzed in previous EA documents and the Atlantic G&G Final PEIS (**Table 2-1**) and are not discussed further because these activities would be the same, with the exception that met towers would not be installed as part of the Proposed Action within this Draft EA. The absence of met towers from the Proposed Action, as compared to the Proposed Actions of previous EAs, would not substantively affect the conclusions of the previous EAs with respect to potential impacts to coastal infrastructure. Existing commercial ports, harbors, or industrial areas composing the coastal infrastructure could be used when implementing the Proposed Action, including primarily Delaware, Maryland, and Virginia ports.

Activities associated with the Proposed Action would not require additional coastal infrastructure to be constructed, would not require expansion of port areas (even if smaller ports are used), and would be smaller in scale than ongoing activities at existing ports. Consistent with previous EAs (**Table 2-1**), there would be no impacts on coastal infrastructure from site characterization and site assessment activities because the existing infrastructure and facilities would be adequate to accommodate Proposed Action activities. Therefore, there would be no impacts on coastal infrastructure in the vicinity of the WEAs.

Demographics and Employment

The potential impacts on demographics and employment that could occur as a result of site characterization and site assessment activities have been previously analyzed in previous EA documents and the Atlantic G&G Final PEIS (**Table 2-1**); it was concluded that impacts from these activities were expected to be negligible. The types of activities addressed in those documents would have similar impacts as the Proposed Action would have on demographics and employment in the Delaware, Maryland, Virginia, and North Carolina coastal areas. Temporary employment associated with Proposed Action activities, such as surveying and met buoy fabrication and installation, could occur in various coastal counties of the four Central Atlantic states. However, the small number of workers directly employed in these activities would be insufficient to have a perceptible impact on overall measures of employment and demographics in the four-state area. BOEM estimated in the Atlantic G&G PEIS (BOEM 2014) that G&G surveys would likely be conducted by existing geophysical, engineering or oceanographic/environmental firms with little or no new employment. The crew size for smaller vessels could range from 10 to 20 crew members, with larger vessels having a crew size of about 40 per vessel. Therefore, the impacts on demographics and employment from the Proposed Action would be short term and negligible.

Environmental Justice

The anticipated leases would be located approximately 18.9 nm or more from the nearest shoreline. Therefore, the site assessment and site characterization activities occurring within the WEAs would not have disproportionately high or adverse environmental or health effects on minority or low-income populations. Only the use of existing coastal facilities to support proposed site assessment and site characterization activities has the potential to impact minority or low-income populations if port expansions were required. However, existing coastal facilities (ports and harbors) in Delaware, Maryland, and Virginia would support proposed activities without any need for expansion. Because disproportionately high and adverse human health or environmental effects that would disproportionately affect low-income and minority persons would not occur as a result of the Proposed Action, there would be no impacts on environmental justice.

Physical Oceanography

Physical oceanography would not be affected by survey vessels, or by the installation of met buoys within the Central Atlantic. Ocean current characteristics, water column density stratification, and vertical current structure, among other factors, would be considered by the lessee during the planning, operation, and data post-processing activities as part of the SAP. Although the water column would be disrupted by the installation and decommissioning of met buoys, effects on physical properties of the water column and ocean currents would be nominal, and the majority of effects would occur directly to the seafloor, as addressed above in **Bathymetry, Geology, and Sediments**. No impacts are anticipated on ocean currents, water column density, or other physical oceanographic characteristics from the Proposed Action.

Visual Resources

Previous NEPA evaluations include descriptions of the affected environment for visual resources along the entire Atlantic Coast, including the Central Atlantic (BOEM 2012; 2015a; MMS 2007b). The potential impacts on visual resources associated with site characterization and site assessment activities would be negligible. Impacts on visual resources are analyzed in detail in the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic OCS Offshore North Carolina, Revised EA* (BOEM 2015a) and *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et. al., 2012). Previous determinations in previous EAs and the Atlantic G&G Final PEIS (**Table 2-1**) focus on visual impacts from the installation of met towers, which will not occur under the Proposed Action analyzed in this Draft EA. From their closest points, the WEAs vary from 24.5 to 87.2 nm off the coast of Delaware, from 18.9 to 61.1 nm off the coast of Maryland, from 19.0 to 43.4 nm off the coast of Virginia, and from 35.4 to 128.3 nm off the coast of North Carolina. Met buoys would not be distinguishable from a vessel at those distances because they sit only a few meters off the waterline (BOEM 2014b). Given the distance of the proposed lease areas from shore, the fact that no new coastal infrastructure would be necessary, and the relatively small amount of vessel traffic associated with the Proposed Action, visual impacts on onshore cultural resources and recreation and tourism would be limited and temporary in nature and would most likely not be distinguishable from existing vessel traffic.

Water Quality

The routine activities associated with the Proposed Action that would impact coastal and marine water quality include vessel discharges (including bilge and ballast water, and sanitary waste), geotechnical and benthic sampling, and installation and removal of met buoys. Non-routine events include the recovery of lost survey equipment.

Impacts on coastal and marine waters from vessel discharges would likely be of short duration and remain undetectable or minimal with adherence to regulations governing discharges (BOEM 2015a). The Proposed Action is not anticipated to increase runoff or onshore discharge into harbors, waterways, coastal areas, or the ocean environment, as proposed onshore activities would not involve expansion of existing port infrastructure. As indicated in **Section 2.4**, most site characterization and site assessment activities would be covered by USACE Nationwide Permit Number NWP 5 (*Scientific Measurement Devices*) and NWP Number 6 (*Survey Activities*). USACE indicated that site characterization and site assessment activities outlined in the EA that may require Corps authorization, such as met buoys, would likely qualify for USACE general permits. NWPs were developed to provide a streamlined evaluation and approval process for certain activities that have minimal adverse environmental impact, both individually and collectively. An individual permit may be required from USACE if the proposed survey activities do not meet the terms and conditions of the NWPs or if USACE determines that the survey activities would result in more than minimal adverse effects on the aquatic environment. Sediment disturbance resulting from anchoring and coring would be short term, would temporarily impact local turbidity and water clarity, and is not anticipated to result in any significant impact on any area within the WEAs or along any potential export cable route.

Impacts on water quality could occur during met buoy installation and decommissioning, with water quality rapidly returning without mitigation to its original state during operation of the met buoys and after decommissioning. Sediment disturbance and resultant turbidity associated with recovering lost equipment would be similar to small-scale benthic trawling conducted as part of commercial fishing operations in the area and would not be out of character for the region. Therefore, impacts from routine vessel discharges, sediment disturbance from geotechnical/benthic sampling and met buoy installation and decommissioning, and recovery of lost equipment on coastal and marine water quality would be negligible, with any changes being small in magnitude, highly localized, and transient. Measurable short-term transient turbidity or water quality changes from spills may occur. Impacts from spill events could be minor and result in localized short term impacts to water quality.

B.3 Alternative A – No Action Alternative and Affected Environment

B.3.1 Air Quality and Greenhouse Gas Emissions

Air quality is characterized by comparing the ambient air concentrations of criteria pollutants to the National Ambient Air Quality Standards (NAAQS), which have been established by the U.S. Environmental Protection Agency (USEPA) to be protective of human health and welfare. The NAAQS have been established in 40 Code of Federal Regulations (CFR) Part 50 for each of the six criteria pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$: particulate matter with a diameter less than or equal to 10 and 2.5 micrometers [µm], respectively), and lead (Pb). Ozone is not emitted directly but forms in the atmosphere from precursor pollutants such as nitrogen oxides (NO_X) and volatile organic compounds (VOCs). The USEPA has also established emission standards for Hazardous Air Pollutants (HAPs).

When the monitored pollutant levels in an area exceed the NAAQS for any pollutant, USEPA designates the area as being in "nonattainment" for that pollutant. The coastal areas nearest the Central Atlantic Wind Energy Areas (WEAs) include Sussex County, Delaware; Worcester County, Maryland; and Accomack and Northampton Counties, Virginia; all on the Delmarva Peninsula, as well as Cape May County, New Jersey; the City of Virginia Beach, Virginia; and Currituck County, North Carolina. Sussex County, Delaware, Cape May County, New Jersey, and the City of Virginia Beach, Virginia, are designated marginal nonattainment for O_3. Worcester County, Maryland, Accomack and Northampton Counties, Virginia, and Currituck County, North Carolina, are designated attainment/unclassifiable for all criteria air pollutants (USEPA 2023a, 2023b, 2023c, 2023d, 2023e).

Conclusion

Under the No Action Alternative, the Bureau of Ocean Energy Management (BOEM) would not issue any leases for commercial wind energy development in the Central Atlantic WEAs, and there would be no effects on air quality associated with the Proposed Action. However, BOEM expects climate change, ongoing activities, and planned actions to have continuing regional air quality impacts over the timeframe considered in the EA (**Appendix D**). Over the timeframe considered in this EA, local impacts on air quality from climate change are likely to be small, incremental, and difficult to discern from effects of other ongoing actions. The largest ongoing contributors to impacts on air quality stem from vessel traffic.

Reasonably foreseeable planned offshore wind projects could result in increased vessel traffic resulting in increased air emissions and impacts on regional air quality, and could also lead to reduced emissions from fossil-fuel power-generating facilities and result in beneficial impacts on regional air quality. However, fossil-fuel energy facilities may increase in number and level of pollution-generating activities or remain operational to meet future increases in power demand and would likely be fired by natural gas, oil, or coal based on the current electricity generation mix in the Eastern U.S. Considering all the impact-producing factors (IPFs) together, BOEM anticipates that the overall impacts associated with ongoing and reasonably foreseeable planned actions in the geographic analysis area may result in **minor** adverse impacts due to criteria pollutant emissions.

B.3.2 Cultural, Historical, and Archaeological Resources

The geographic analysis area for cultural, historic, and archaeological resources is the Area of Potential Effects (APE), defined as the depth and breadth of the seabed that could potentially be affected by seafloor/ground-disturbing activities associated with site characterization activities. The APE for site characterization activities includes the discrete horizontal and vertical areas of the seafloor that may be impacted through geotechnical sampling, which may include the collection of core samples, soil borings, or other bottom-disturbing techniques that could directly affect historic properties on or below the seafloor, if present. In addition, geotechnical sampling may also require the use of barges or anchored vessels that could also directly affect historic properties, if present.

Site characterization activities could occur within the extent of the Central Atlantic WEAs and along corridors that extend from the WEAs to the onshore energy grid. Because any right-of-way (ROW) or right-of-use and easement (RUE) grants considered as part of this undertaking have not been issued, BOEM is uncertain of the exact location of these cable corridor surveys. However, BOEM can anticipate their geographic extent given that power generated from potential Central Atlantic lease areas would need to be transmitted to shore, either directly from the lease areas by individual export cables to onshore cable landings and/or to offshore regional transmission system(s). These potential export cables are anticipated to be offshore Delaware, Maryland, and Virginia. Therefore, for the purposes of this undertaking, BOEM estimates that the APE associated with cable site characterization activities would occur within discrete corridors in the region between shore and the Central Atlantic WEAs as far north as a line drawn between the northwestern corner of WEA A-2 and central Delaware and as far south as a line drawn between the southwestern corner of WEA C-1 and the southeastern Virginia coastline (Figure B-1).

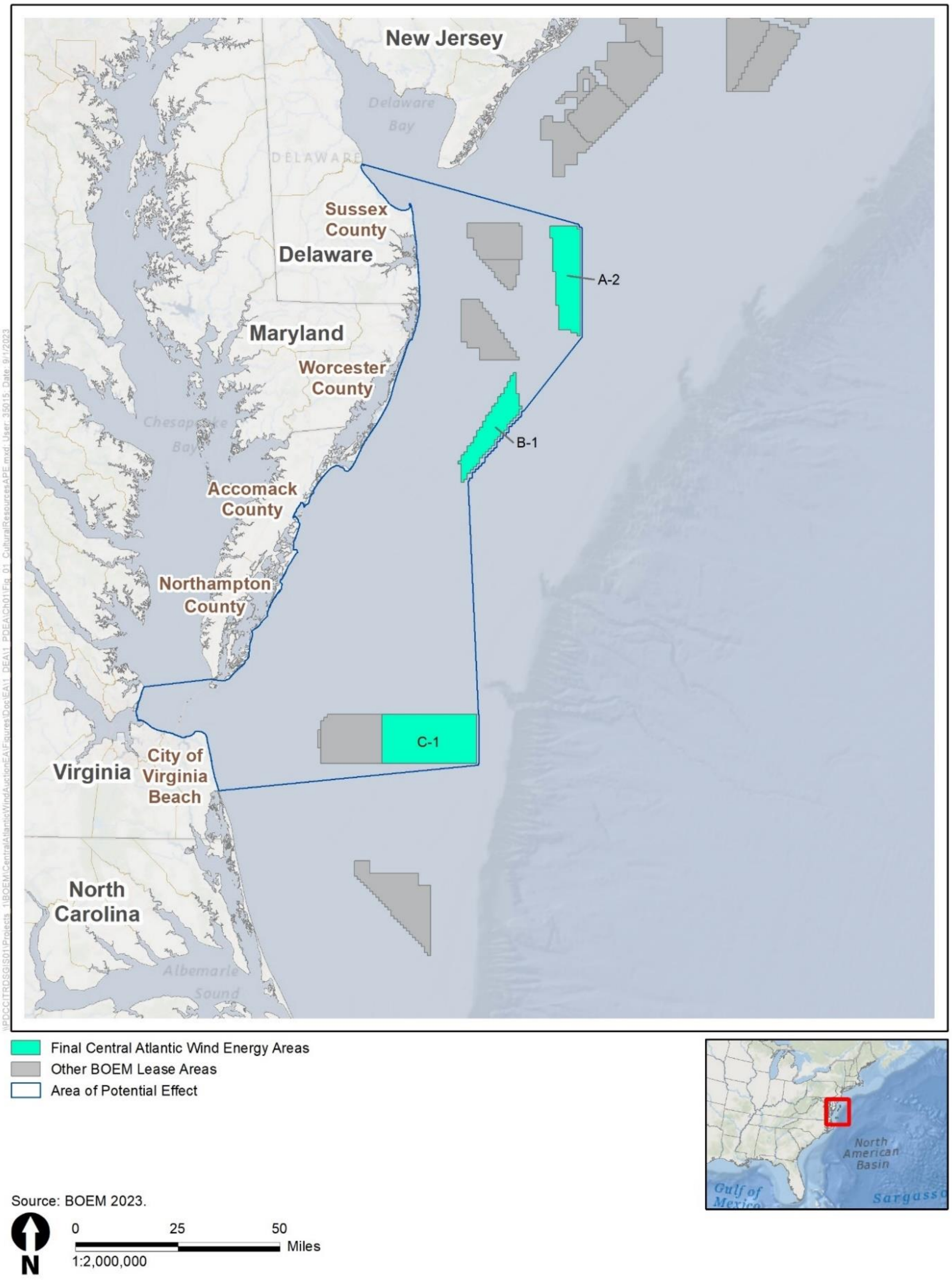

Figure B-1. The Central Atlantic Wind Energy Areas and Area of Potential Effects

A number of documents report on the potential for submerged marine cultural resources within the Central Atlantic regions and are incorporated herein by reference (BOEM 2012a; BOEM 2021). Offshore, submerged historic properties that may be located within the proposed WEAs include marine archaeological resources, which are the physical remnants of past human activity that occurred at least 50 years ago and are submerged underwater. These may include both pre-contact indigenous archaeological sites, and historic-period archaeological sites such as shipwrecks and downed aircraft (BOEM 2012b).

The Central Atlantic WEAs and potential cable corridors are located within the region of the Outer Continental Shelf (OCS) that formerly may have been exposed above sea level and available to human occupation during the early pre-contact period. Corresponding with lower global sea level during the Late Pleistocene, the section of the OCS where the Central Atlantic WEAs are located was once exposed, dry land that was subsequently submerged by rising sea levels during the Early Holocene. These once-exposed areas are identified as having a high potential for the presence of now-submerged archaeological sites dating to the time periods during which they were exposed. Around 13,000 B.P., these areas would have contained coastal zone characteristics such as barrier island lagoons where archaeological sites were likely to exist and where site burial was highly possible (BOEM 2012b). Based on sea level rise, the Central Atlantic WEAs have a high potential for the presence of submerged archaeological sites dating from the Paleoindian through Early Archaic periods, and very low to no potential for the presence of submerged pre-contact archaeological sites more recent than the Middle Archaic period.

Since the advent of colonial expansion into North America, numerous vessels have plied the waters offshore the Central Atlantic, and, consequently, shipwrecks are a type of historic submerged cultural resource expected to be found within the Central Atlantic and the navigation routes that filter vessel traffic to the ports in Delaware, Maryland, and Virginia. The greatest concentration of known or reported shipwrecks per-linear mile of coastline in the Atlantic region is found offshore the Mid-Atlantic states (BOEM 2012a). However, many of the WEAs are in regions that have not been previously surveyed for the presence of submerged archaeological resources. Based on prior research (BOEM 2012a, 2012b) and the current review of the BOEM Atlantic Shipwreck Database (BOEM 2020) and other relevant sources, all three Central Atlantic WEAs and the APE covering the possible area for cable routes to shore are characterized as having a high probability for containing shipwrecks or other submerged historic-period archaeological resources.

A review of BOEM's Atlantic Shipwreck Database revealed that there are 41 marine archaeological resources, or potential marine archaeological resources, reported within the WEAs (BOEM 2020). Of these 41 resources within the WEAs, 20 are shipwrecks with documented vessel names, and 12 of the 20 reported shipwrecks within the WEAs have documented dates for sinking. The remaining 21 of the 41 total resources reported within the WEAs include 16 unidentified anomalies, 2 barges, and 3 unnamed downed aircraft. Additionally, the location reliability for 39 of the identified resources is classified as medium, with one entry classified as having low location reliability and one classified as high location reliability.

Additionally, the review of BOEM's Atlantic Shipwreck Database revealed that there are an additional 694 marine archaeological resources, or potential marine archaeological resources, reported outside of the WEAs but within the APE (BOEM 2020). The National Oceanic and Atmospheric Administration's

(NOAA's) Automated Wrecks and Obstructions (AWOIS) Database (NOAA 2016) documents a total of 323 wrecks and 299 obstructions in the APE; however, many of these directly correspond with entries in BOEM's Atlantic Shipwreck Database (BOEM 2020). Culling the AWOIS database entries that are duplicated in the BOEM database indicates an additional 153 wrecks and 198 obstructions that are unique to the AWOIS database and located in the APE. All 153 of the AWOIS wrecks in the APE are located outside of the WEAs. Just one AWOIS obstruction (ID# 15019) is located within WEA C-1, and the remaining 197 obstructions are in the broader APE.

A search of the Delaware, Maryland, and Virginia State Historic Preservation Office (SHPO) databases revealed that there are 39 known offshore marine archaeological resources within the APE (Delaware SHPO 2023; Maryland SHPO 2023; Virginia SHPO 2023). None of the 39 resources are located within the WEAs. Twenty-six of the resources are classified as shipwrecks, of which 14 include a site or vessel name, and 12 are unidentified. The remaining 13 of the 39 total resources are unidentified submerged anomalies. One resource is listed on the National Register of Historic Places (NRHP), 1 resource has been determined eligible by the Virginia SHPO for the NRHP, 3 are classified by the Virginia SHPO as "potentially eligible" pending further evaluation for the NRHP, and the remaining 34 have not been evaluated for NRHP eligibility.

Conclusion

The Central Atlantic WEAs have a high potential for the presence of marine archaeological resources including submerged pre-contact archaeological sites dating from the Paleoindian through Early Archaic periods and submerged historic resources including shipwrecks. Under the No Action Alternative, BOEM would not issue any commercial wind energy leases in the Central Atlantic WEAs, and there would be no effects on cultural, historical, and archaeological resources attributable to the Proposed Action.

Regardless of lease issuance associated with the Proposed Action, BOEM expects climate change, ongoing activities, and planned actions to have continuing regional impacts on cultural, historical, and archaeological resources over the timeframe considered in the EA. These ongoing and reasonably foreseeable planned actions are described in **Appendix D** of this EA.

Ongoing and planned actions could adversely impact potentially significant marine cultural resources. However, Federal law requires that offshore activities associated with renewable energy development, gas pipelines, and other submarine cable installations, submit archaeological survey results and assessment of seafloor impacts on potential submerged cultural resources when bottom-disturbing activities are planned. Marine cultural resource surveys identify significant resources and support a determination of their NRHP eligibility. Based on the results of those surveys and assessments, the planned actions would be designed to avoid impacting known submerged cultural resources or to minimize impacts to varying degrees. If potentially significant marine cultural resources cannot be avoided, other measures to mitigate impacts would be required per Section 106 of the National Historic Preservation Act. Considering all the IPFs together, BOEM anticipates that the impacts associated with ongoing and reasonably foreseeable planned actions in the geographic analysis area may result in **minor** to **major** adverse impacts. The duration of impacts would range from temporary to permanent, but the extent and frequency of impacts is largely dependent on the unique characteristics of individual cultural, historical, and archaeological resources. If marine cultural resources can be avoided, the overall effect would be small; if not avoided, the overall effect would be large, and the resource would not be recoverable.

While impacts on cultural, historical, and archaeological resources associated with reasonably foreseeable planned actions could range from **minor** to **major**, BOEM anticipates that implementation of existing state and Federal cultural resource laws and regulations would reduce the magnitude of overall impacts on cultural resources due to requirements to avoid, minimize, or mitigate project-specific impacts on cultural resources. These state and Federal requirements may not be able to reduce the severity of impacts on some cultural resources due to the unique character of specific resources but would reduce the severity of potential impacts in a majority of cases, resulting in overall **moderate** impacts on cultural resources.

B.3.3 Recreation and Tourism

The area of analysis for recreation and tourism stretches from the coastline to a 40-mile buffer surrounding each of the three WEAs. This includes areas within 24.5 to 87.2 nautical miles (nm) (45.4 to 161.5 kilometers [km]) of the coastline of Delaware, 18.9 to 61.1 nm (35 to 113.2 km) of the coastline of Maryland, 19.0 to 43.4 nm (35.2 to 80.4 km) of the coastline of Virginia, and 35.4 to 128.3 nm (65.6 to 237.6 km) of the coastline of North Carolina. Although many recreation and tourism opportunities exist in inland portions of coastal counties in Delaware, Maryland, Virginia, and North Carolina, the assessment for the EA focuses on the areas located along the shoreline that may depend on coastal settings.

In all the coastal communities, recreational activities and tourism are a mix of land and ocean activities and attractions, such as bird watching, biking, historic landmarks, swimming, surfing, boating, and fishing. Given the regional importance and unique attributes of recreational fishing in Delaware, Maryland, Virginia, and North Carolina as compared to other types of recreation and tourism, recreational fishing is discussed as part of the analysis in **Section 3.3.2** of the EA. Whale and dolphin watching excursions are popular off the Virginia coast and in the Delaware Bay. Most of these tours occur within approximately 15 miles (24 km) of the coast; general viewing areas also exist approximately 70 miles (113 km) offshore Virginia and 50 miles (80 km) offshore Delaware (Northeast Ocean Data 2022). While the Central Atlantic wind energy area is outside of the primary and secondary whale watching areas, it overlaps with the transit routes to and from the secondary areas farther offshore.

In 2012, BOEM conducted a study to identify areas on the Atlantic Coast likely to experience impacts on tourism and recreational economies from offshore wind development (BOEM 2012c), and this study is incorporated in this section by reference. The study identified communities, including those within in the geographic analysis area, sensitive to impacts on tourism for employment and business and that have relatively higher levels of tourism jobs.

The most recent data available by the NOAA (2020) shows that ocean-related jobs make up 4.1% of total employment for New Jersey, 6.3% for Delaware, 4.1% for Maryland, 3.3% for Virginia, and 1.1% for North Carolina. Of those ocean-related jobs, the percentage linked to recreation and tourism is provided in **Table B-1** for the coastal counties near the Central Atlantic WEAs. While ocean-related jobs may represent a relatively small percentage of total employment for each state or county, ocean-related recreation and tourism jobs make up a large component of those jobs. Generally, these activities are anticipated to continue with no discernible change in trends for the timeframe of the Proposed Action.

Table B-1. Percentage of ocean-related recreation and tourism jobs by county/city

County / City / State	Total Percentage Ocean-Related Jobs	Percentage of Ocean-Related Recreation and Tourism Jobs
New Jersey	**3.3**	**49.8**
Cape May	23.9	91.9
Delaware	**6.3**	**72.6**
Sussex	12.9	96.1
Maryland	**4.1**	**54.4**
Worcester	28.5	98.4
Virginia	**3.3**	**43.3**
Accomack	6.1	94.1
Northampton	14.9	66.3
City of Virginia Beach	11.7	97.0
North Carolina	**1.1**	**85.1**
Currituck	12	100
Dare	25.1	89

Sources: NOAA 2020.

Conclusion

Under the No Action Alternative, BOEM would not issue any commercial wind energy leases in the Central Atlantic WEAs, and there would be no effects on recreation and tourism attributable to the Proposed Action. Although leases would not be issued under the No Action Alternative, BOEM expects climate change, ongoing activities, and planned actions to have continuing regional impacts on recreation and tourism over the timeframe considered in the EA (**Appendix D**).

Ongoing actions that may result in impacts on recreation and tourism in the geographic analysis area are primarily marine transportation (commercial shipping), commercial fishing, and military use; however, these activities have co-existed in the Central Atlantic for a significant amount time. Planned activities described in **Appendix D** may generate increased onshore and offshore vehicle traffic or alter traffic patterns that could inconvenience recreational users, primarily during construction in localized areas near port facilities and on existing roadways frequented by recreational users. These planned actions could also generate increased nearshore and offshore vessel traffic; for wind energy development projects, this increased traffic would primarily occur during construction, along routes between ports and the offshore wind construction areas.

In-water structures (wind turbines and offshore substations) associated with planned offshore wind projects could affect recreation and tourism. Recreational impacts would include the risk of recreational vessel allision with in-water structures, fishing gear entanglement, vessel damage or loss, increased navigation hazards, vessel traffic congestion, space-use conflicts, and presence of cables and infrastructure. Offshore routes for recreational boaters, anglers, sailboat races, and sightseeing boats could require adjustment to avoid allision risks with in-water structures.

Conversely, new in-water structures could result in several beneficial impacts, including increased recreational fishing by introducing new aquatic habitats and increased tourism by people interested in viewing the structures.

Considering all the IPFs together, BOEM anticipates that the overall impacts associated with ongoing and reasonably foreseeable planned actions in the geographic analysis area may result in **minor** adverse impacts on recreation and tourism, because the overall effect would be small and the resource would be expected to recover completely.

B.4 Alternative B – Proposed Action

B.4.1 Air Quality and Greenhouse Gas Emissions

Air emission sources for site assessment activities include vessels for site characterization activities, including high-resolution geophysical (HRG) surveys, geotechnical surveys, and biological surveys, and installation, operation, and decommissioning of up to eight meteorological (met) buoys that would be used for site assessment. Vessel traffic due to site characterization surveys and site assessment activities would add to current vessel traffic levels in the Central Atlantic and to traffic levels at the existing ports used by the survey vessels. The additional vessel activity associated with the Proposed Action over a 5- to 7-year span would be temporary and negligible as compared with existing vessel traffic levels in the region and at the existing ports (**Section 3.4.5** of the EA).

Impacts from criteria pollutant emissions associated with these vessel operations would be localized within the Central Atlantic WEAs and in the vicinity of the existing ports used to support vessel activity. For outer continental shelf (OCS) permitting purposes, WEAs A-2, B-1, and C-1 would be approximately 22-, 18-, and 32-statute miles (35.4-, 29.0-, 51.5 km) from the nearest state seaward boundary, respectively. Estimated potential criteria pollutant emissions and greenhouse gas (GHG) emissions for the vessel operations were calculated and the results are provided in **Appendix C**. Estimated annual air emissions for Years 1–7 are summarized in **Appendix C** (**Table C-1**). The numbers of vessel trips associated with the Proposed Action, upon which the air emission calculations are based, along with the assumptions used to complete the calculations of the numbers of vessel trips, are provided in **Appendix A**. Air emissions from onshore activities associated with the Proposed Action are expected to be negligible in comparison with the existing onshore activities because existing port facilities would be utilized, and no expansion would be needed of these facilities to accommodate the Proposed Action.

Major Source Thresholds

Major source thresholds are defined in the Clean Air Act for purposes of permitting stationary emission sources on land. The major source thresholds do not apply to the Proposed Action, which would not site stationary sources of emissions on land. Still, they are used here as screening levels for assessing potential air quality impacts. Major source thresholds for the counties/cities closest to the WEAs, including the City of Virginia Beach, Virginia, Sussex County, Delaware, and Worcester County, Maryland, are as follows (USEPA 2023f):

- 100 tons/year of NO_X (O_3 precursor)
- 50 tons/year of VOCs (O_3 precursor)
- 100 tons/year of CO
- 100 tons/year of PM
- 100 tons/year of SO_2
- 10 tons/year for any single HAP or 25 tons/year for any combination of HAPs

As indicated in **Appendix C** (**Table C-1**), estimated annual potential criteria pollutant emissions from the Proposed Action are expected to be less than major source thresholds, are not expected to lead to any exceedance of the NAAQS.

Non-Routine Events

The recovery of lost equipment could affect air quality through additional vessel traffic. Traffic associated with non-routine activities would likely be from a single vessel for a short duration; impacts are expected to be negligible.

Federal Class I Areas

Section 162(a) of the Clean Air Act establishes air quality protections for designated Federal Class I areas such as national parks, national wilderness areas, and national monuments. The Class I area closest to the Central Atlantic WEAs is Brigantine Wilderness Area in New Jersey, which is approximately 49 miles (79 km) from the closest WEA in the Central Atlantic (offshore Sussex County, Delaware). Federal Land It is not anticipated that Proposed Action activities in the WEAs and in the vicinity of existing ports will impact visibility or acidic deposition in the Brigantine Wilderness Area.

Climate Change

Climate change is a global issue that results from the increase in GHGs in the atmosphere. The most recent available data on GHG emissions in the United States indicate that annual emissions in 2021 were an estimated 6,340.2 million metric tons (USEPA 2023g). Additional information about the impacts of climate change is presented in **Appendix D.**

Conclusion

As shown in **Table C-1** in **Appendix C**, criteria pollutant concentrations due to air emissions from the Proposed Action vessel operations are not expected to lead to any violation of the NAAQS. The main impact drivers for the Proposed Action stem from site assessment activities that would be conducted to support construction of planned wind projects. Although the air pollutant and GHG emissions estimates from the Proposed Action are measurable, they would not be distinguishable from other air emissions onshore or offshore and are not expected to lead to an exceedance of the NAAQS (**Appendix C**), though the GHG emissions would contribute incrementally to global climate change. Air quality impacts due to vessel emissions from site assessment and site characterization activities for the Proposed Action are expected to be **negligible** because they would not substantively add to the impacts that are already occurring from existing vessel traffic and would not lead to an exceedance of the NAAQS.I

Cumulative Impacts: The incremental impacts under the Proposed Action resulting from individual IPFs are expected to be **negligible** for air quality. BOEM anticipates that the cumulative impacts associated with the Proposed Action and with ongoing and reasonably foreseeable planned actions would be **minor** for air quality in the geographic analysis area because impacts are unavoidable; however, the overall effect is expected to be small, and planned wind projects could generate long-term, beneficial impacts by providing energy to the region from a renewable resource and reducing health events due to onshore criteria pollutant emissions.

B.4.2 Cultural, Historical, and Archaeological Resources

Expected impacts on offshore historic properties during routine activities would be similar to those described in previous EAs (**Table 2-1**; **Section 2.3**, of the EA). As noted, HRG surveys do not create bottom disturbances, and thus impacts would not be expected to occur on historic properties during routine survey. Subsurface geotechnical investigations, benthic sampling, and installation of met buoys would disturb the seabed. Existing regulatory requirements (e.g., BOEM's *Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585*) and lease stipulations require that a qualified marine archaeologist identify historic properties through analysis of HRG data before bottom disturbance occurs. Consequently, those resources can be avoided during site characterization activities. Implementation of an Unanticipated Discovery Plan in the event submerged cultural resources are encountered during site characterization further reduces the risk of impacts on submerged resources. Accordingly, previous National Environmental Policy Act documentation developed for, or assessing, site characterization and site assessment campaigns have determined that the potential to impact historic properties is expected to be negligible.

The Proposed Action is expected to include the temporary placement of eight met buoys and other site characterization activities, including geophysical, geotechnical, biological, and oceanographic surveys. Based on the distance from shore and the minor in scale and temporary manner in which site characterization studies will likely occur, BOEM has concluded that the equipment and vessels performing these activities will be indistinguishable from existing lighted vessel traffic for an observer onshore. Therefore, BOEM has not defined onshore areas from which the site characterization activities would be visible as part of the APE. In addition, there is no indication that the issuance of a lease or grant of a RUE or ROW and subsequent site characterization will involve expansion of existing port infrastructure. Therefore, onshore staging activities are not considered as part of the APE for this specific undertaking.

Under the Proposed Action BOEM would issue commercial wind energy leases in the Central Atlantic WEAs. However, lease and grant stipulations will require lessees/grantees to perform HRG surveys prior to any seafloor-disturbing activities, and to avoid any potential historic properties identified through the archaeological analysis of their HRG surveys during the conduct of bottom-disturbing activities associated with site characterization activities. With these protective measures included as lease and grant stipulations, impacts on cultural, historical, and archaeological resources from the Proposed Action are anticipated to be **negligible**.

Non-Routine Events

The retrieval of lost equipment could result in seafloor disturbance that could impact potential historic properties. Lost equipment may be located and/or retrieved through dragging anchors or some other form of grapnel tool across the seafloor. Such activities have the potential to impact marine cultural resources by disturbing the bottom during search and retrieval. Regardless, the potential for recovery operations to interact with marine cultural resources is extremely unlikely given the expanse of the proposed Central Atlantic WEAs and offshore export cable routes, and the limited area affected by recovery operations; therefore, impacts are expected to be negligible. However, potential impacts could be lessened or avoided by reviewing existing geophysical survey data and the locations of known or potential historic properties that have already been identified prior to retrieval, and implementing avoidance of any known or potential resources during retrieval.

Conclusion

Overall, impacts on cultural, historical, and archaeological resources are expected to be **negligible**. Impacts on submerged historic properties from site characterization activities are expected to be **negligible** given the geophysical surveying requirements and lease conditions discussed above. Impacts on submerged historic properties from installation of met buoys are expected to be **negligible**, as avoidance would be required by BOEM. If avoidance of potential historic properties is not feasible, BOEM will continue its Section 106 consultation (**Section 5.2.5** of the EA) to resolve adverse effects. Vessel traffic associated with the Proposed Action would be indistinguishable from existing vessel traffic and would be short term. Therefore, impacts on onshore historic properties from site characterization activities are expected to be **negligible**.

Cumulative Impacts: The incremental impacts under the Proposed Action resulting from individual IPFs would be negligible for cultural, historical, and archaeological resources. BOEM anticipates that the cumulative impacts associated with the Proposed Action would be **moderate** for cultural, historical, and archaeological resources in the geographic analysis area. BOEM anticipates that implementation of existing state and Federal cultural resource laws and regulations would reduce the magnitude of overall impacts on cultural resources due to requirements to avoid, minimize, or mitigate project-specific impacts on cultural resources leading to a reduction in the severity of potential impacts in a majority of cases.

B.4.3 Recreation and Tourism

Impacts on recreational resources and tourism are not anticipated in connection with the Proposed Action. It is anticipated that the number of vessels associated with the Proposed Action would be nominal relative to existing vessel traffic in the geographic analysis area. As discussed in **Section 3.1** of the EA, existing ports or industrial areas are expected to be used by vessels associated with the Proposed Action, and expansion of these existing facilities is not anticipated. It is most likely that vessel traffic associated with Proposed Action would use established vessel traffic lanes. As tourism and recreation exists in its current state in the context of existing military, commercial, and recreational water and air vessels that currently traverse these coastal areas, it is unlikely that there would be any detrimental impact on tourism and recreation from the nominal additional vessels associated with the Proposed Action.

Offshore structures associated with the Proposed Action would be limited to the placement of met buoys. Offshore routes for recreational boaters and sightseeing boats may need to be altered to avoid allision risks with the in-water structures; however, no substantial or long-term conflicts with existing and planned recreation and tourism uses are anticipated. Due to the distance to shore of the WEAs, it is estimated that the met buoys would not be visible from shore or would be indistinguishable from existing vessel traffic (**Section 3.4.5** of the EA).

Non-Routine Events

The recovery of lost equipment could affect recreation and tourism through additional vessel traffic. The extent of impacts would depend on the type of lost equipment. The size of the lost equipment and/or the replacement cost would dictate the number of attempts made at recovery. The number of recovery attempts could affect the size of the resultant impact area and the time spent searching. The potential for recovery operations to interact with recreation and tourism activities is unlikely given that recovery operations would typically involve one vessel for a short period of time; therefore, impacts are anticipated to be negligible.

Conclusion

Impacts on recreation and tourism resulting from routine and non-routine activities would be short term and are expected to be **negligible**. No new onshore coastal construction would occur under the Proposed Action, and the amount of vessel traffic associated with the Proposed Action is expected to be relatively minimal, thereby limiting vessel traffic.

Cumulative Impacts: The incremental impacts under the Proposed Action resulting from individual IPFs would be negligible for recreation and tourism. BOEM anticipates that the cumulative impacts associated with the Proposed Action would be **minor** for recreation and tourism in the geographic analysis area. The overall effect would be small, and the resource would be expected to recover completely, with no mitigating action required. Both short- and long-term impacts would result from the Proposed Action in combination with other reasonably foreseeable planned actions, including short-term noise disturbances affecting the potentially serene character of some recreational areas, especially during construction activities. Some navigation hindrances could occur that would impact recreational boating and fishing. However, some long-term, beneficial impacts could result from the reef effect of offshore wind energy and other in-water structures, which would provide additional hard habitat for marine species and landing areas for birds, thereby potentially enhancing recreational birding, sightseeing, and fishing activities.

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Appendix C: Air Emissions Calculations

This appendix provides air emissions calculations to support the analysis of air quality and greenhouse gas emissions presented in **Appendix B**. **Tables C-1 and C-2** provide emission summaries and **Tables C-3 through C-9** provide emissions calculations for the analyzed site characterization and site assessment activities. **Table C-10** provides a summary of hazardous air pollutant (HAP) emissions from site characterization and site assessment activities.

Table C-1. Summary of annual emissions by activity

Action Alternative	Year	Activity/Year	Emissions (tons/year)						Emissions (metric tons/year)			
			CO	NO_x	VOC	$PM_{2.5}$	PM_{10}	SO_x	CO_2	N_2O	CH_4	CO_{2e}
A	No Action	No Action			No Action and, therefore, no emissions							
B	Year 1	Site Characterization: HRG Surveys Site Characterization: Geotech and Benthic Surveys Site Characterization: Biological Surveys	2.81	17.93	0.52	0.44	0.45	0.01	1,074.98	0.03	0.14	1,087.97
	Year 2	Site Characterization: HRG Surveys Site Characterization: Geotech and Benthic Surveys Site Characterization: Biological Surveys Site Assessment: Meteorological Buoy Installations Site Assessment: Meteorological Buoy Operations	3.29	20.98	0.60	0.51	0.53	0.01	1,257.80	0.04	0.17	1,273.00
	Year 3	Site Characterization: HRG Surveys Site Characterization: Geotech and Benthic Surveys Site Characterization: Biological Surveys Site Assessment: Meteorological Buoy Operations	3.13	19.96	0.57	0.49	0.50	0.01	1,196.86	0.04	0.16	1,211.32
	Year 4	Site Characterization: HRG Surveys Site Characterization: Geotech and Benthic Surveys Site Characterization: Biological Surveys Site Assessment: Meteorological Buoy Operations	3.13	19.96	0.57	0.49	0.50	0.01	1,196.86	0.04	0.16	1,211.32
	Year 5	Site Characterization: HRG Surveys Site Characterization: Geotech and Benthic Surveys Site Characterization: Biological Surveys Site Assessment: Meteorological Buoy Operations	3.13	19.96	0.57	0.49	0.50	0.01	1,196.86	0.04	0.16	1,211.32
	Year 6	Site Assessment: Meteorological Buoy Operations	0.32	2.03	0.06	0.05	0.05	0.00	121.89	0.00	0.02	123.36
	Year 7	Site Assessment: Meteorological Buoy Decommissioning	0.16	1.02	0.03	0.02	0.03	0.00	60.94	0.00	0.01	61.68

CO = carbon monoxide; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalents; CH_4 = methane; HRG = high-resolution geophysical; N_2O = nitrogen dioxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less; SO_X = sulfur oxides; VOC = volatile organic compounds

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 New York: Revised Environmental Assessment (NY EA). BOEM 2016-070, October 2016. Available at: https://www.boem.gov/renewable-energy/state-activities/lease-ocs-0512.

Assumptions, data, table footnotes, and references—range of lease activity, port locations, etc. are taken from the Central Atlantic Wind Auction EA.

Assumes site characterization activities would take place equally over Years 1–5 and the meteorological buoys would be installed in Year 2, operate in Years 2–6 and be decommissioned in Year 7.

Assumes maximum range of leases are up to four leases.

Table C-2. Detailed emission estimation of annual emissions by activities for an average year

Emissions Summary for Average Year – Proposed Action[1]

Phase/Source Description	Emissions (tons/year)						Emissions (metric tons/year)			
	CO	NO_X	VOC	$PM_{2.5}$	PM_{10}	SO_X	CO_2	N_2O	CH_4	CO_2e
Surveys										
Site Characterization—Offshore Surveys										
Vessel Travel – HRG	1.41	8.96	0.26	0.22	0.23	0.01	537.32	0.02	0.07	543.81
Vessel Travel – Geotech and Benthic	0.94	6.01	0.17	0.15	0.15	0.00	360.16	0.01	0.05	364.51
Vessel Travel – Biological	0.46	2.96	0.09	0.07	0.07	0.00	177.50	0.01	0.02	179.65
Site Characterization—Per Year from Years 1–5	**2.81**	**17.93**	**0.52**	**0.44**	**0.45**	**0.01**	**1,074.98**	**0.03**	**0.14**	**1,087.97**
Meteorological Buoys										
Site Assessment—Installation										
Vessel Travel	0.16	1.02	0.03	0.02	0.03	0.00	60.94	0.00	0.01	61.68
Site Assessment—Installation Year 2	**0.16**	**1.02**	**0.03**	**0.02**	**0.03**	**0.00**	**60.94**	**0.00**	**0.01**	**61.68**
Site Assessment—Offshore O&M										
Vessel Travel	0.32	2.03	0.06	0.05	0.05	0.00	121.89	0.00	0.02	123.36
Site Assessment—O&M per Year from Years 2–6	**0.32**	**2.03**	**0.06**	**0.05**	**0.05**	**0.00**	**121.89**	**0.00**	**0.02**	**123.36**
Site Assessment—Offshore Decommissioning[2]										
Vessel Travel	0.16	1.02	0.03	0.02	0.03	0.00	60.94	0.00	0.01	61.68
SUBTOTAL Decommissioning—Year 7	**0.16**	**1.02**	**0.03**	**0.02**	**0.03**	**0.00**	**60.94**	**0.00**	**0.01**	**61.68**

CO = carbon monoxide; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalents; CH_4 = methane; HRG = high-resolution geophysical; N_2O = nitrogen dioxide; NO_X = nitrogen oxides; O&M = operations and maintenance; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less; SO_X = sulfur oxides; VOC = volatile organic compounds

[1] Maximum range of leases assessed for this EA are four leases.

[2] Assumes potential emissions for meteorological buoy decommissioning are the same as for installation.

Table C-3. Site characterization activities – offshore surveys

Survey Vessel Details

Survey Task	Vessel Type	Proposed Action					
		Total Number of Vessel Round Trips	Duration of Survey Task (years)	Number of Vessel Round Trips (per year)[3]	Average Miles per Round Trip (nautical miles)	Total (nautical miles/year)[5]	Activity (hours/year)[6, 7]
HRG Survey – Export Cable Routes[1]	Crew Boat	-	5	-	-	2,701	600
HRG Surveys – Lease Areas[1]	Crew Boat	-	5	-	-	6,939	1,542
Geotechnical Sampling[2]	Small Tug Boat	-	5	-	-	-	764
Avian Surveys[3]	Crew Boat	36	5	7	130	933	93
Fish Surveys[4]	Crew Boat	128	5	26	74	1,905	614

HRG = high-resolution geophysical

[1] HRG survey activity hours calculated based on total vessel kilometers and hours from worksheet titled "A-1 HRG."

[2] Geotechnical sampling activity hours calculated based on total vessel days from sheet titled "A-2 GT and Ben." Assumes all round trips over the 5 year period were performed using Small Tug Boat in conjunction with small Cargo Barge, which does not have an engine. Assumes geotechnical and benthic sampling occur concurrently for export cable.

[3] Avian survey activity hours calculated based on total vessel roundtrips and roundtrip distance from sheet titled ""A-5 MM_ST_Avian Surveys." Assumes all avian surveys completed by boat to obtain maximum case scenario. Assumes avian and fish surveys occur over 5 years over all lease areas.

[4] Fish survey activity hours calculated based on total vessel days from sheet titled "A-4 Fish Surveys."

[5] Round trips per year estimated by dividing total round trips per task by the number of years over which the surveys will be conducted.

[6] Assumes the following average speeds to estimated activity hours based on total nautical miles traveled.

HRG Survey	4.5	knots	
Tugs Boats/Barges 12	knots		
Avian Survey	10	knots	
Fish Survey	3.1	knots	(average trawl speed)

[7] No time for the vessels spent at idle was captured in this calculation.

0.53996 nautical miles/kilometer

Table C-4. Estimated annual emissions for vessels from HRG site characterization survey activities

Emission Factors for Vessels

Vessel Type	Engine Size (hp)	Engine Power (kW)[1]	Emission Factors (g/kW-hr)[3] Load Factor (%)[2]	CO	NO_x	VOC	$PM_{2.5}$	PM_{10}	SO_X	CO_2	N_2O[4]	CH_4[4]
Crew Boat	1,000	746	45%	1.6	10.3	0.3	0.25	0.26	0.006	679	0.02	0.09

CO = carbon monoxide; CO_2 = carbon dioxide; CH_4 = methane; g/kW-hr = grams per kilowatt-hour; hp = horsepower; kW = kilowatt; N_2O = nitrogen dioxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less; SO_X = sulfur oxides; VOC = volatile organic compounds

[1] Engine power (kW) estimated by dividing horsepower by a factor of 1.341.

[2] Load factors based on Table 3-4 of Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories, USEPA, April 2009. Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors are for Harbor Vessels.

[3] Emission factors based on Table 5 of Category 1 and 2 Commercial Marine Vessel 2020 Emissions Inventory, USEPA, February 2022. Tier 0 factors were used for both types of boats, providing a conservative assumption for pollutants for which the areas are in non-attainment.

[4] Emission factors based on Table 3-8 of Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories, U.S. EPA, April 2009. Tier 0, Category 2 (typically between 1,000 and 3,000 kW) factors were used for both types of boats since the crew boat is almost always within that category, and it provides a conservative assumption for pollutants for which the areas are in non-attainment.

Emissions from Vessels – Average Year Over 5 Years

Alternative	Vessel Type	Emissions (tons/year, metric tons/year for GHG pollutants)[1,2]									
		CO	NO_x	VOC	$PM_{2.5}$	PM_{10}	SO_x	CO_2	N_2O	CH_4	CO_{2e}[3]
Proposed Action	Crew Boat – Export Cable Routes	0.39	2.51	0.07	0.06	0.06	0.00	150.54	0.00	0.02	152.35
	Crew Boat – Lease Area	1.01	6.45	0.19	0.16	0.16	0.00	386.78	0.01	0.05	391.45
	TOTAL	**1.41**	**8.96**	**0.26**	**0.22**	**0.23**	**0.01**	**537.32**	**0.02**	**0.07**	**543.81**

CO = carbon monoxide; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalents; CH_4 = methane; GHG = greenhouse gas; N_2O = nitrogen dioxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less; SO_X = sulfur oxides; VOC = volatile organic compounds

[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 ÷ 2,000 (or 2,204.62). 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 harbor tug to account for auxiliary engines based on Table 3-10 of US EPA 2009 document.

[3] Global Warming Potential: CO_2 = 1; N_2O =298; CH_4 = 25 (USEPA 40 CFR 98 Table A-1 [5/19]).

Table C-5. Estimated annual emissions for vessels from geotechnical and benthic site characterization survey activities

Emission Factors for Vessels

Vessel Type	Engine Size (hp)	Engine Power (kW)[1]	Load Factor (%)[2]	Emission Factors (g/kW-hr)[3]								
				CO	NO_x	VOC	$PM_{2.5}$	PM_{10}	SO_x	CO_2	N_2O[4]	CH_4[4]
Small Tug Boat	2,000	1,491	31%	1.6	10.3	0.3	0.25	0.26	0.006	679	0.02	0.09

CO = carbon monoxide; CO_2 = carbon dioxide; CH_4 = methane; g/kW-hr = grams per kilowatt-hour; hp = horsepower; kW = kilowatt; N_2O = nitrogen dioxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less; SO_X = sulfur oxides; VOC = volatile organic compounds

[1] Engine power (kW) estimated by dividing horsepower by a factor of 1.341.

[2] Load factors based on Table 3-4 of Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories, USEPA, April 2009. Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors are for Harbor Vessels.

[3] Emission factors based on Table 5 of Category 1 and 2 Commercial Marine Vessel 2020 Emissions Inventory, USEPA, February 2022. Tier 0 factors were used for both types of boats, providing a conservative assumption for pollutants for which the areas are in non-attainment.

[4] Emission factors based on Table 3-8 of Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories, USEPA, April 2009. Tier 0, 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.

Emissions from Vessels – Average Year Over 5 Years

Alternative	Vessel Type	Emissions (tons/year, metric tons/year for GHG pollutants)[1,2]									
		CO	NO_X	VOC	$PM_{2.5}$	PM_{10}	SO_X	CO_2	N_2O	CH_4	CO_2e[3]
Proposed Action	Small Tug Boat	0.94	6.01	0.17	0.15	0.15	0.00	360.16	0.01	0.05	364.51
	TOTAL	**0.94**	**6.01**	**0.17**	**0.15**	**0.15**	**0.00**	**360.16**	**0.01**	**0.05**	**364.51**

CO = carbon monoxide; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalents; CH_4 = methane; GHG = greenhouse gas; N_2O = nitrogen dioxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less; SO_X = sulfur oxides; VOC = volatile organic compounds

[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 ÷ 2,000 (or 2,204.62). For GHG pollutants CO_2, N_2O, and CH_4, emissions are in metric tons.

[2] Power adjustment of 1.5 was assumed for a harbor tug to account for auxiliary engines based on Table 3-10 of U.S. EPA 2009 document.

[3] Global Warming Potential: CO_2 = 1; N_2O = 298; CH_4 = 25 (USEPA 40 CFR 98 Table A-1 [5/19]).

Table C-6. Estimated annual emissions for vessels from biological site characterization survey activities

Emission Factors for Vessels

Vessel Type	Engine Size (hp)	Engine Power (kW)[1]	Load Factor (%)[2]	Emission Factors (g/kW-hr)[3]								
				CO	NO_X	VOC	$PM_{2.5}$	PM_{10}	SO_X	CO_2	N_2O[4]	CH_4[4]
Crew Boat	1,000	746	45%	1.6	10.3	0.3	0.25	0.26	0.006	679	0.02	0.09

CO = carbon monoxide; CO_2 = carbon dioxide; CH_4 = methane; g/kW-hr = grams per kilowatt-hour; hp = horsepower; kW = kilowatt; N_2O = nitrogen dioxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less; SO_X = sulfur oxides; VOC = volatile organic compounds

[1] Engine power (kW) estimated by dividing horsepower by a factor of 1.341.

[2] Load factors based on Table 3-4 of Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories, USEPA, April 2009. Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors are for Harbor Vessels.

[3] Emission factors based on Table 5 of Category 1 and 2 Commercial Marine Vessel 2020 Emissions Inventory, USEPA, February 2022. Tier 0 factors were used for both types of boats, providing a conservative assumption for pollutants for which the areas are in non-attainment.

[4] Emission factors based on Table 3-8 of Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories, USEPA, April 2009. Tier 0, 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.

Emissions from Vessels – Average Year Over 5 Years

Alternative	Vessel Type	Emissions (tons/year, metric tons/year for GHG pollutants)[1,2]									
		CO	NO_X	VOC	$PM_{2.5}$	PM_{10}	SO_X	CO_2	N_2O	CH_4	CO_2e[3]
Proposed Action	Crew Boat – Avian Surveys	0.06	0.39	0.01	0.01	0.01	0.00	23.40	0.00	0.00	23.68
	Crew Boat – Fish Surveys	0.40	2.57	0.07	0.06	0.06	0.00	154.10	0.00	0.02	155.96
	TOTAL	**0.46**	**2.96**	**0.09**	**0.07**	**0.07**	**0.00**	**177.50**	**0.01**	**0.02**	**179.65**

CO = carbon monoxide; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalents; CH_4 = methane; GHG = greenhouse gas; N_2O = nitrogen dioxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less; SO_X = sulfur oxides; VOC = volatile organic compounds

[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 ÷ 2,000 (or 2,204.62). 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 harbor tug to account for auxiliary engines based on Table 3-10 of USEPA 2009 document.

[3] Global Warming Potential: CO_2 = 1; N_2O = 298; CH_4 = 25 (USEPA 40 CFR 98 Table A-1 [5/19]).

Table C-7. Offshore site assessment activities

Vessel Details for Installation of Buoys

Vessel Type	Total Number of Vessel Round Trips/Year[1]	Average Miles per Round Trip (nautical miles)	Total (nautical miles/year)[3]	Activity (hours/year)[4, 5, 6]
Crew Boat	16	182	2,916	243

[1] Assumes two trip/buoy, two buoys/lease area, four lease areas.

[2] Assumes "high" estimate of roundtrips per buoy to provide a conservative estimate.

[3] Roundtrip distance from worksheet titled "Trip Distances."

[4] Assumes an average speed of 12 knots for the crew boat.

[5] Activity hours based upon total nautical miles traveled.

[6] No time for the vessels spent at idle at the buoys was captured in this calculation.

0.53996 nautical miles/kilometer

Vessel Details for Operation and Maintenance of Buoys

Vessel Type	Total Number of Vessel Round Trips/Year[1]	Average Miles per Round Trip (nautical miles)	Total (nautical miles/year)[3]	Activity (hours/year)[4, 5, 6, 7]
Crew Boat	48	182	8,747	486

[1] Assumes one trip/buoy pair, 12 times per year, four 4 lease areas.

[2] Assumes monthly maintenance instead of quarterly to provide a conservative estimate.

[3] Roundtrip distance from worksheet titled "Trip Distances."

[4] Assumes an average speed of 18 knots for the crew boat.

[5] Activity hours based upon total nautical miles traveled.

[6] No time for the vessels spent at idle at the buoys was captured in this calculation.

[7] Assumes buoys are operational for 5 years.

Table C-8. Estimated annual emissions for vessels from meteorological buoy installation as a part of site assessment activities

Emission Factors for Vessels

Vessel Type	Engine Size (hp)	Engine Power (kW)[2]	Load Factor (%)[3]	Emission Factors (g/kW-hr)[4]								
				CO	NO_X	VOC	$PM_{2.5}$[6]	PM_{10}	SO_X	CO_2	N_2O [5]	CH_4 [5]
Crew Boat[1]	1,000	746	45	1.6	10.3	0.3	0.25	0.26	0.006	679	0.02	0.09

CO = carbon monoxide; CO_2 = carbon dioxide; CH_4 = methane; g/kW-hr = grams per kilowatt-hour; hp = horsepower; kW = kilowatt; N_2O = nitrogen dioxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less; SO_X = sulfur oxides; VOC = volatile organic compounds

[1] Supply vessels are typically used to deploy meteorological buoys, assume crew boat emission factors listed in Table 3-4 of Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories, USEPA, April 2009.

[2] Engine power (kW) estimated by dividing horsepower by a factor of 1.341.

[3] Load factors based on Table 3-4 of Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories, USEPA, April 2009. Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors are for Harbor Vessels.

[4] Emission factors based on Table 5 of Category 1 and 2 Commercial Marine Vessel 2020 Emissions Inventory, USEPA, February 2022. Tier 0 factors were used for both types of boats, providing a conservative assumption for pollutants for which the areas are in non-attainment.

[5] Emission factors based on Table 3-8 of Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories, USEPA, April 2009. Tier 0, 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.

Emissions from Vessels – One Year

Vessel Type	Emissions (tons/year, metric tons/year for GHG pollutants)[1,2]									
	CO	NO_X	VOC	$PM_{2.5}$	PM_{10}	SO_X	CO_2	N_2O	CH_4	CO_2e[3]
Crew Boat	0.16	1.02	0.03	0.02	0.03	0.00	60.94	0.00	0.01	61.68
TOTAL	**0.16**	**1.02**	**0.03**	**0.02**	**0.03**	**0.00**	**60.94**	**0.00**	**0.01**	**61.68**

CO = carbon monoxide; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalents; CH_4 = methane; GHG = greenhouse gas; N_2O = nitrogen dioxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less; SO_X = sulfur oxides; VOC = volatile organic compounds

[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 ÷ 2,000 (or 2,204.62). 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 harbor tug to account for auxiliary engines based on Table 3-10 of USEPA 2009 document.

[3] Global Warming Potential: CO_2 = 1; N_2O = 298; CH_4 = 25 (USEPA 40 CFR 98 Table A-1 [5/19]).

Table C-9. Offshore site assessment activities – routine maintenance and evaluation

Emission Factors for Vessels

Vessel Type	Engine Size (hp)	Engine Power (kW)[1]	Load Factor (%)[2]	Emission Factors (g/kW-hr)[3]								
				CO	NO_X	VOC	$PM_{2.5}$[4]	PM_{10}	SO_X	CO_2	N_2O[4]	CH_4[4]
Crew Boat	1,000	746	45	1.6	10.3	0.3	0.25	0.26	0.006	679	0.02	0.09

CO = carbon monoxide; CO_2 = carbon dioxide; CH_4 = methane; g/kW-hr = grams per kilowatt-hour; hp = horsepower; kW = kilowatt; N_2O = nitrogen dioxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less; SO_X = sulfur oxides; VOC = volatile organic compounds

[1] Engine power (kW) estimated by dividing horsepower by a factor of 1.341.

[2] Load factors based on Table 3-4 of Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories, USEPA, April 2009. Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors are for Harbor Vessels.

[3] Emission factors based on Table 5 of Category 1 and 2 Commercial Marine Vessel 2020 Emissions Inventory, USEPA, February 2022. Tier 0 factors were used for both types of boats, providing a conservative assumption for pollutants for which the areas are in non-attainment.

[4] Emission factors based on Table 3-8 of Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories, U.S. EPA, April 2009. Tier 0, 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.

Emissions from Vessels – Average Year Over 5 Years

Vessel Type	Emissions (tons/year, metric tons/year for GHG pollutants)[1,2]									
	CO	NO_X	VOC	$PM_{2.5}$	PM_{10}	SO_X	CO_2	N_2O	CH_4	CO_2e[3]
Crew Boat	0.32	2.03	0.06	0.05	0.05	0.00	121.89	0.00	0.02	123.36
TOTAL	**0.32**	**2.03**	**0.06**	**0.05**	**0.05**	**0.00**	**121.89**	**0.00**	**0.02**	**123.36**

CO = carbon monoxide; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalents; CH_4 = methane; GHG = greenhouse gas; N_2O = nitrogen dioxide; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less; SO_X = sulfur oxides; VOC = volatile organic compounds

[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 ÷ 2,000 (or 2,204.62). 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 harbor tug to account for auxiliary engines based on Table 3-10 of U.S. EPA 2009 document.

[3] Global Warming Potential: CO_2 = 1; N_2O = 298; CH_4 = 25 (USEPA 40 CFR 98 Table A-1 [5/19]).

Table C-10. Annual emissions of hazardous air pollutants from site characterization and site assessment activities

Pollutant	Pollutant Code	Basis	Fraction[1]	Survey			Buoy	
				HRG	Geotechnical & Benthic	Biological	Installation	O&M
1,3-Butadiene	106990	VOC	1.01E-03	2.61E-04	1.38E-04	8.62E-05	2.96E-05	5.92E-05
2,2,4-Trimethylpentane	540841	VOC	7.12E-03	1.83E-03	9.73E-04	6.06E-04	2.08E-04	4.16E-04
Acenaphthene	83329	VOC	5.09E-05	1.31E-05	6.96E-06	4.33E-06	1.49E-06	2.98E-06
Acenaphthylene	208968	VOC	1.18E-04	3.04E-05	1.61E-05	1.00E-05	3.45E-06	6.90E-06
Acetaldehyde	75070	VOC	9.78E-03	2.52E-03	1.34E-03	8.33E-04	2.86E-04	5.72E-04
Acrolein	107028	VOC	1.85E-03	4.76E-04	2.53E-04	1.57E-04	5.40E-05	1.08E-04
Ammonia	NH_3	$PM_{2.5}$	1.92E-02	4.21E-03	2.24E-03	1.39E-03	4.78E-04	9.56E-04
Anthracene	120127	VOC	3.44E-04	8.86E-05	4.70E-05	2.93E-05	1.01E-05	2.01E-05
Antimony	7440360	$PM_{2.5}$	6.15E-04	1.35E-04	7.14E-05	4.45E-05	1.53E-05	3.05E-05
Arsenic	7440382	$PM_{2.5}$	2.59E-05	5.67E-06	3.01E-06	1.87E-06	6.43E-07	1.29E-06
Benz[a]Anthracene	56553	$PM_{2.5}$	8.82E-06	1.93E-06	1.02E-06	6.38E-07	2.19E-07	4.38E-07
Benzene	71432	VOC	4.74E-03	1.22E-03	6.48E-04	4.03E-04	1.39E-04	2.77E-04
Benzo[a]Pyrene	50328	$PM_{2.5}$	4.18E-06	9.15E-07	4.85E-07	3.02E-07	1.04E-07	2.08E-07
Benzo[b]Fluoranthene	205992	$PM_{2.5}$	8.35E-06	1.83E-06	9.70E-07	6.04E-07	2.07E-07	4.15E-07
Benzo[k]Fluoranthene	207089	$PM_{2.5}$	4.18E-06	9.15E-07	4.85E-07	3.02E-07	1.04E-07	2.08E-07
Benzo(g,h,i)Perylene	203123	$PM_{2.5}$	1.32E-04	2.89E-05	1.53E-05	9.55E-06	3.28E-06	6.55E-06
Cadmium	7440439	$PM_{2.5}$	2.36E-04	5.17E-05	2.74E-05	1.71E-05	5.86E-06	1.17E-05
Chrysene	218019	$PM_{2.5}$	1.63E-05	3.57E-06	1.89E-06	1.18E-06	4.05E-07	8.09E-07
Chromium (VI)	18540299	$PM_{2.5}$	7.24E-09	1.58E-09	8.41E-10	5.24E-10	1.80E-10	3.60E-10
Dibenzo[a,h]anthracene	53703	$PM_{2.5}$	8.65E-06	1.89E-06	1.00E-06	6.26E-07	2.15E-07	4.30E-07
Ethyl Benzene	100414	VOC	4.39E-04	1.13E-04	6.00E-05	3.74E-05	1.28E-05	2.57E-05
Fluoranthene	206440	$PM_{2.5}$	8.97E-05	1.96E-05	1.04E-05	6.49E-06	2.23E-06	4.45E-06
Fluorene	86737	VOC	1.64E-04	4.23E-05	2.24E-05	1.40E-05	4.79E-06	9.59E-06
Formaldehyde	50000	VOC	4.27E-02	1.10E-02	5.84E-03	3.63E-03	1.25E-03	2.50E-03
Indeno[1,2,3-c,d]Pyrene	193395	$PM_{2.5}$	8.35E-06	1.83E-06	9.70E-07	6.04E-07	2.07E-07	4.15E-07
Lead	7439921	$PM_{2.5}$	1.25E-04	2.74E-05	1.45E-05	9.04E-06	3.10E-06	6.21E-06
Manganese	7439965	$PM_{2.5}$	3.22E-06	7.05E-07	3.74E-07	2.33E-07	7.99E-08	1.60E-07

Pollutant	Pollutant Code	Basis	Fraction[1]	Survey			Buoy	
				HRG	Geotechnical & Benthic	Biological	Installation	O&M
Mercury	7439976	$PM_{2.5}$	4.18E-08	9.15E-09	4.85E-09	3.02E-09	1.04E-09	2.08E-09
Naphthalene	91203	VOC	3.13E-02	8.07E-03	4.28E-03	2.66E-03	9.15E-04	1.83E-03
Hexane	110543	VOC	2.79E-03	7.19E-04	3.81E-04	2.38E-04	8.15E-05	1.63E-04
Nickel	7440020	$PM_{2.5}$	6.87E-04	1.50E-04	7.98E-05	4.97E-05	1.71E-05	3.41E-05
Polychlorinated Biphenyls	1336363	$PM_{2.5}$	4.18E-07	9.15E-08	4.85E-08	3.02E-08	1.04E-08	2.08E-08
Phenanthrene	85018	VOC	1.36E-03	3.49E-04	1.85E-04	1.15E-04	3.96E-05	7.93E-05
Propionaldehyde	123386	VOC	1.52E-03	3.91E-04	2.07E-04	1.29E-04	4.43E-05	8.87E-05
Pyrene	129000	$PM_{2.5}$	3.37E-05	7.38E-06	8.57E-07	6.20E-08	1.54E-09	7.64E-11
Selenium	7782492	$PM_{2.5}$	4.38E-08	9.59E-09	5.09E-09	3.17E-09	1.09E-09	2.18E-09
Toluene	108883	VOC	2.04E-03	5.24E-04	2.78E-04	1.73E-04	5.95E-05	1.19E-04
Xylenes (Mixed Isomers)	1330207	VOC	1.42E-03	3.66E-04	1.94E-04	1.21E-04	4.16E-05	8.31E-05
o-Xylene	95476	VOC	5.13E-04	1.32E-04	7.01E-05	4.37E-05	1.50E-05	3.00E-05
HAP Totals					**0.0135**	**0.0084**	**0.0029**	**0.0058**

HAP = hazardous air pollutants; O&M = operations and maintenance; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; VOC = volatile organic compounds

[1] USEPA. 2022. Ports Emissions Inventory Guidance: Methodologies for Estimating Port-Related and Goods Movement Mobile Source Emissions (EPA-420-B-22-011). Appendix D: HAP Speciation Profiles for Commercial Marine Engines. Available: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1014J1S.pdf. Accessed: November 2023.

Appendix D: Planned Action Scenario and IPFs

D.1 Introduction

This appendix discusses resource-specific ongoing and reasonably foreseeable planned actions that could occur and for which impacts from the Proposed Action could occur in the same location and timeframe as impacts from these other actions. The Proposed Action is issuance of commercial and research wind energy leases within the Wind Energy Areas (WEAs) that the Bureau of Ocean Energy Management (BOEM) has designated on the Outer Continental Shelf (OCS) in the Central Atlantic (defined as an offshore area extending generally south from offshore Delaware to Cape Hatteras, North Carolina) and the granting of rights-of-way (ROWs) and rights-of-use and easement (RUEs) in support of wind energy development.

BOEM used a localized geographic scope to evaluate impacts from planned actions for resources that are fixed in nature (i.e., their location is stationary, such as benthic and archaeological resources), or for resources where impacts from the Proposed Action would only occur in waters in and directly around the Central Atlantic proposed lease areas (e.g., water quality). This scope includes potential activities that would occur on the Atlantic OCS offshore Delaware, Maryland, Virginia, and North Carolina, as well as activities that would take place in state waters. However, the geographic boundaries for the analysis for marine mammals, sea turtles, fish/fishing, and birds include the entire Central Atlantic. Additionally, the area for cultural, historical, and archaeological resources encompasses the depth and breadth of the seabed between shore and the WEAs as far south as a line drawn between the southeastern corner of the WEA C-1 to the City of Virginia Beach, Virginia, and as far north as a line drawn between the northeastern corner of the WEA A-2 to the northeastern point of Sussex County, Delaware. BOEM has not defined onshore areas from which the site characterization activities would be visible as part of the study area, because BOEM has concluded that the equipment and vessels performing these activities would be indistinguishable from existing lighted vessel traffic for an observer onshore. In addition, there is no indication that the issuance of a lease or grant of a RUE or ROW and subsequent site characterization would involve expansion of existing port infrastructure. Therefore, onshore staging activities are not considered as part of the cultural, historical, and archaeological resources study area. This scenario addresses ongoing and planned actions occurring between the start of Proposed Action activities in 2024 and the completion of decommissioning of meteorological (met) buoys in 2030 or 2031, depending on when the leases are issued.

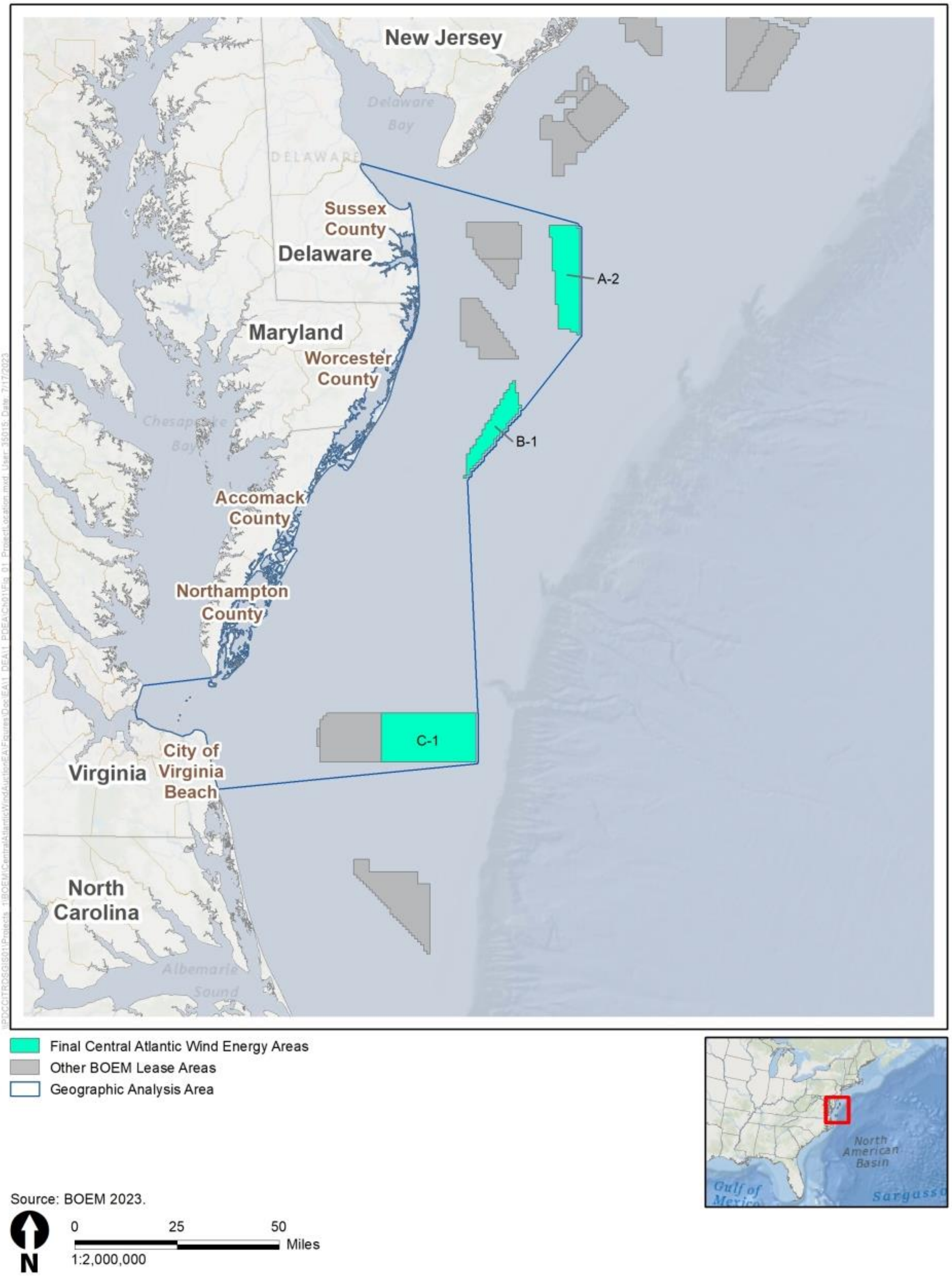

Figure D-1. Central Atlantic Wind Energy Areas shown with the geographic analysis area considered for migratory species

D.2 Ongoing and Reasonably Foreseeable Planned Actions

This section includes a list of the projects and the impact-producing factors (IPFs) that BOEM has identified as potentially contributing to reasonably foreseeable impacts when combined with impacts from the Proposed Action over the geography and time scale described above. Reasonably foreseeable planned actions, which are discussed below, include eight types of actions: (1) other wind energy development activities, such as site characterization surveys; site assessment activities; and construction, operation, and decommissioning of wind energy facilities; (2) hydrokinetic projects; (3) undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); (4) marine minerals use and ocean dredged material disposal; (5) military use; (6) marine transportation; (7) fisheries use and management; and (8) global climate change.

The Coastal Virginia Offshore Wind Commercial (CVOW-C) Project Final Environmental Impact Statement (EIS) (BOEM 2023) provides additional information on planned actions in the region. However, the CVOW-C EIS considers projects much larger in scope than the Proposed Action.

BOEM completed a study of IPFs on the North Atlantic OCS to consider in an offshore wind development cumulative impacts scenario (Avanti Corporation and Industrial Economics Inc. 2019). The study identifies cause-and-effect relationships between renewable energy projects and resources potentially affected by such projects. It further classifies those relationships into a manageable number of IPFs through which renewable energy projects could affect resources. It also identifies the types of actions and activities to be considered in a “planned actions” impacts scenario. The study identifies actions and activities that may affect the same physical, biological, economic, or cultural resources as renewable energy projects and states that such actions and activities may have the same IPFs as offshore wind projects.

IPFs associated with the Proposed Action include:

- Increased vessel presence and traffic resulting in associated noise, air emissions, lighting, vessel discharges; the potential for strikes and spills; and the potential for increased aircraft traffic from biological surveys and associated noise, lighting, and air emissions.
- Additional underwater noise associated with high-resolution geophysical survey activities.
- Installation and decommissioning of met buoys, geotechnical/seabed sampling, and biological survey activities resulting in bottom disturbance.
- Space-use conflicts during survey activities.
- Presence of structures resulting in a fish aggregating device effect and entanglement in buoy or anchor components.

The eight types of actions listed above are anticipated to all result in IPFs that overlap both spatially and temporally with the Proposed Action and that would affect the same resources. BOEM (2019) provides additional information about the IPFs associated with each action. The eight types of activities that make up the Planned Actions Scenario are described in the following sections.

D.2.1 Other Wind Energy Development Activities

These activities would include site characterization surveys and site assessment activities (like the Proposed Action), as well as construction and operation of wind turbines for any other wind energy projects in the timeframe that overlaps with the Proposed Action (2024–2030/2031). **Table D-1** provides a list of these Atlantic offshore wind development projects.

Table D-1. Ongoing and planned wind energy development in the geographic analysis area

Region	Lease	Lease/Project/Lease Remainder	Status	Estimated Offshore Construction Schedule
DE/MD	OCS-A 0519	Skipjack, part of OCS-A 0519	COP, PPA, SAP	By 2030
DE/MD	OCS-A 0519	OCS-A 0519 remainder	Planning	By 2030
DE/MD	OCS-A 0490	US Wind, Inc./Maryland Offshore Wind	COP, PPA, SAP	2025
DE/MD	OCS-A 0482	Garden State Offshore Energy I, LLC	Planning	By 2030
VA	OCS-A 0483	Coastal Virginia Offshore Wind Commercial	COP, SAP	2024–2026
DE	OCS-A 0482	Garden State Offshore Energy I,LLC	One met buoy; deployed 1/20/2020	By 2030
VA	OCS-A 0497	Coastal Virginia Offshore Wind Pilot	Two turbines	Built

COP = Construction and Operations Plan; DE = Delaware; MD = Maryland; VA = Virginia; met = meteorological; OCS = Outer Continental Shelf; PPA=Power Purchase Agreement; SAP = Site Assessment Plan.

D.2.2 Hydrokinetic Projects

The New Jersey Board of Public Utilities is evaluating the potential use of tidal energy (NJBPU 2023; Barlow 2023); however, no tidal energy projects are currently planned or in operation within the Central Atlantic region.

D.2.3 Undersea Transmission Lines, Gas Pipelines, and Other Submarine Cables

A number of submarine cables—including fiber-optic cables and trans-Atlantic cables—exist with landings along the Delaware, Maryland, Virginia, and North Carolina coastlines. Although no planned cable systems were identified, BOEM anticipates that other projects could overlap with the Proposed Action within the Central Atlantic over the lifespan considered in the EA.

Additionally, the offshore wind projects listed in **Table D-1** that have a Construction and Operations Plan under review are presumed to include at least one identified transmission cable route. Cable routes have not yet been announced for the remainder of the projects.

D.2.4 Marine Minerals Use and Ocean Dredged Material Disposal

BOEM's Marine Minerals Program currently has one request for active leases for sand borrow areas offshore the Central Atlantic: a 15 million-cubic yard U.S. Army Corps of Engineers (USACE) request 10 miles (16 kilometers) off of the North Carolina coastline (BOEM 2023). Diminishing resources in state waters, the frequency and magnitude of storms along the Atlantic and Gulf of Mexico Coasts, and new infrastructure projects have led BOEM to conduct a study to prepare and meet future sand resource needs (W.F. Baird & Associates Ltd. 2018). According to the study, two projects in Delaware, three in Maryland, three in Virginia, and two in North Carolina are likely, in the next 10 years, to apply for leases to use OCS resources. This finding makes it likely that lease requests will occur, and active leases are possible over the lifespan considered in the EA.

U.S. Environmental Protection Agency (USEPA) Regions 3 and 4 are responsible for designating and managing ocean disposal sites for materials offshore in the region. USACE issues permits for ocean disposal sites, and all ocean sites are for the disposal of dredged material permitted or authorized under the Marine Protection, Research and Sanctuaries Act. There are several dredged material disposal sites in nearshore waters off Virginia and North Carolina located closer to shore than the proposed lease areas (USEPA 2023a and USEPA 2023b).

D.2.5 Military Use

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, U.S. Coast Guard (USCG), and U.S. Air Force have major and minor military installations located along the coasts of Delaware, Maryland, Virginia, and North Carolina.

D.2.6 Marine Transportation

The number of one-way vessel trips in 2020 associated with shipping in the WEA area was reported to be 818 domestic and foreign vessel trips in the Wilmington Harbor, Delaware; 1,768 vessel trips in the Chesapeake and Delaware Canal; 596 vessel trips in the Susquehanna River, Maryland; 941 vessel trips in Potomac River, DC; 5,389 vessel trips in the Norfolk Harbor, Virginia; 5,579 vessel trips in the Port of

Virginia, Virginia; 7,299 vessel trips in Newport News, Virginia; and 15,652 vessel trips in the James River, Virginia (a total of 38,042 one-way trips). Other vessels using these ports include military vessels, commercial business craft (tugboats, fishing vessels, and ferries), commercial recreational craft (cruise ships and fishing/sight-seeing/diving charters), research vessels, and personal craft (fishing boats, houseboats, yachts and sailboats, and other pleasure craft). Over the timeframe assessed in the EA, BOEM assumes that shipping and marine transportation activities would increase above the present level, due in part to the finalized expansion of the Panama Canal, which allows larger vessels to travel through the canal, resulting in an increase in vessel traffic and the size of vessels on the U.S. East Coast (Medina et al. 2021). Several U.S. East Coast ports, including the Port Authority of Delaware, the Maryland Port Authority, the Virginia Port Authority, and the North Carolina Ports, have deepened harbors and expanded cargo-handling facilities to accommodate and attract the larger vessels.

D.2.7 Fisheries Use and Management

The National Marine Fisheries Service (NMFS) implements regulations to manage commercial and recreational fisheries in Federal waters, including those within which the Proposed Action would primarily be located. The governing statute for Federal fisheries management is the Magnuson-Stevens Fishery Conservation and Management Act. This statute requires that fisheries be managed sustainably.

The Proposed Action overlaps one of NMFS' eight regional councils for managing Federal fisheries based on the fishery being considered: Mid-Atlantic Fisheries Management Council (MAFMC), which includes New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina. The MAFMC manages the surf clam and ocean quahog fisheries. The council manages species with many fishery management plans, which are frequently updated, revised, and amended, and coordinated with each other, to jointly manage species across jurisdictional boundaries. Many of the fisheries managed by the councils are fished for in state waters or outside of the Mid-Atlantic region, so the council works with the Atlantic States Marine Fisheries Commission (ASMFC). ASMFC is composed of the 15 Atlantic Coast states and coordinates the management of marine and anadromous resources found in the states' marine waters. In addition, the states and NMFS, under the framework of the ASMFC's Amendment 3 to the Interstate Fishery Management Plan For American Lobster, cooperatively manage the American lobster resource and fishery (Lockhart and Estrella 1997).

The fishery management plans of the councils and ASMFC were established, in part, to manage fisheries to avoid overfishing, which is accomplished through an array of management measures, including annual catch quotas, minimum size limits, and closed areas. These various measures can further reduce (or increase) the size of landings of commercial fisheries in the Mid-Atlantic region. National Oceanic and Atmospheric Administration (NOAA) Fisheries also manages highly migratory species, such as tuna and sharks, which can travel long distances and cross domestic boundaries.

D.2.8 Global Climate Change

Although climate change is not an action, its reach touches nearly all other actions included in this appendix. Climate change is altering the baseline against which the impacts of human actions are measured. It is included in this list as an action and has IPFs that interact with those of OCS wind development to potentially affect resources discussed in the main body of the EA.

The *Programmatic EIS for Alternative Energy Development and Production and Alternate Use of Activities on the Outer Continental Shelf* (MMS 2007) describes global climate change with respect to assessing renewable energy development. Climate change is predicted to affect northeast fishery species differently (Hare et al. 2016), and the NMFS biological opinion discusses in detail the potential impacts of global climate change on protected species that occur within the Proposed Action area (NMFS 2013). Furthermore, current and future impacts of climate change and the way in which they overlap with renewable energy development is assessed in the *National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Continental Shelf* (BOEM 2019).

The Intergovernmental Panel on Climate Change (IPCC) released a special report in October 2018 that assessed the risks and impacts associated with an increase of global warming of 1.5 degrees Celsius (°C) and also compared these to an increase of 2°C (IPCC 2019). The report found that climate-related risks depend on the rate, peak, and duration of global warming, and that an increase of 2°C was associated with greater risks associated with climatic changes, such as extreme weather and drought; global sea level rise; impacts on terrestrial ecosystems; impacts on marine biodiversity, fisheries, and ecosystems and their functions and services to humans; and impacts on health, livelihoods, food security, water supply, and economic growth.

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Appendix E: Essential Fish Habitat Assessment

Contents

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List of Abbreviations and Acronyms

Area ID	Announcement of Area Identification
BOEM	Bureau of Ocean Energy Management
CHIRP	compressed high-intensity radiated pulse
COP	Construction and Operations Plan
CPT	cone penetration test
dB	decibels
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FMP	Fishery Management Plan
HAPC	Habitat Area of Particular Concern
HRG	high-resolution geophysical
MAFMC	Mid-Atlantic Fishery Management Council
MFCMA	Magnuson Fishery Conservation and Management Act of 1976
MMS	Marine Minerals Service
NEFMC	New England Fishery Management Council
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NY Bight	New York Bight
OCS	Outer Continental Shelf
ROW	right-of-way
RUE	right-of-use and easement
SAV	submerged aquatic vegetation
USACE	U.S. Army Corps of Engineers
WEA	Wind Energy Area
YOY	young-of-the-year

E.1 Introduction

Relevant regulations regarding Essential Fish Habitat (EFH) include the Magnuson Fishery Conservation and Management Act of 1976 (MFCMA); Magnuson-Stevens Conservation and Management Act of 1996 (Magnuson-Stevens) and Sustainable Fisheries Act; and Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006.

The MFCMA established the Fishery Management Councils and mandates the preparation of Fishery Management Plans (FMPs) for important fishery resources within the Exclusive Economic Zone (EEZ) in U.S. waters. The Mid-Atlantic Fishery Management Council (MAFMC) and New England Fishery Management Council (NEFMC) prepare FMPs covering the Central Atlantic Wind Auction (CAWA). The 1996 reauthorization of the MFCMA added a requirement for the description of EFH and definitions of overfishing.

"**Essential Fish Habitat**" as defined in the Magnuson-Stevens Act includes "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The final rules promulgated by the National Marine Fisheries Service (NMFS) in 2002 (50 Code of Federal Regulations [CFR] §§600.805 to 600.930) further clarify EFH with the following definitions: "**waters**" refers to aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "**substrate**" refers to sediment, hardbottom, structures underlying the waters, and associated biological communities; "**necessary**" refers to the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "**spawning, breeding, feeding, or growth to maturity"** refers to stages representing a species' full life cycle.

The purpose of this assessment is to evaluate if the Proposed Action would have an "**adverse effect**" on EFH in the proposed Wind Energy Areas (WEAs). The final EFH rules define an adverse effect as follows:

> [A]ny impact which reduces quality and/or quantity of EFH...[and] may include direct or indirect physical, chemical, or biological alterations of the waters or substrate, and loss of, or injury to, benthic organisms, prey species and their *habitat, and other ecosystem components if such modifications reduce the* quantity and/or quantity of EFH. Adverse effects to EFH may result from action occurring within EFH or outside of EFH and may include specific or habitat wide impacts, including individual, cumulative, or synergistic consequences of actions.

E.2 Proposed Action and Geographic Location

On July 31, 2023, the Bureau of Ocean Energy Management (BOEM) released the Announcement of Area Identification (Area ID) (BOEM 2023a). The Area ID Memorandum documents the analysis and rationale used to develop the WEAs in the Central Atlantic. The Central Atlantic is an offshore area extending generally south from offshore Delaware to Cape Hatteras, North Carolina. BOEM has identified three final WEAs in the Central Atlantic and has deferred WEA identification within a fourth deepwater WEA. BOEM partnered with the National Centers for Coastal Ocean Science (NCCOS) to compile best available data and develop spatial models to identify suitable areas for offshore wind energy in the region (NCCOS 2023).

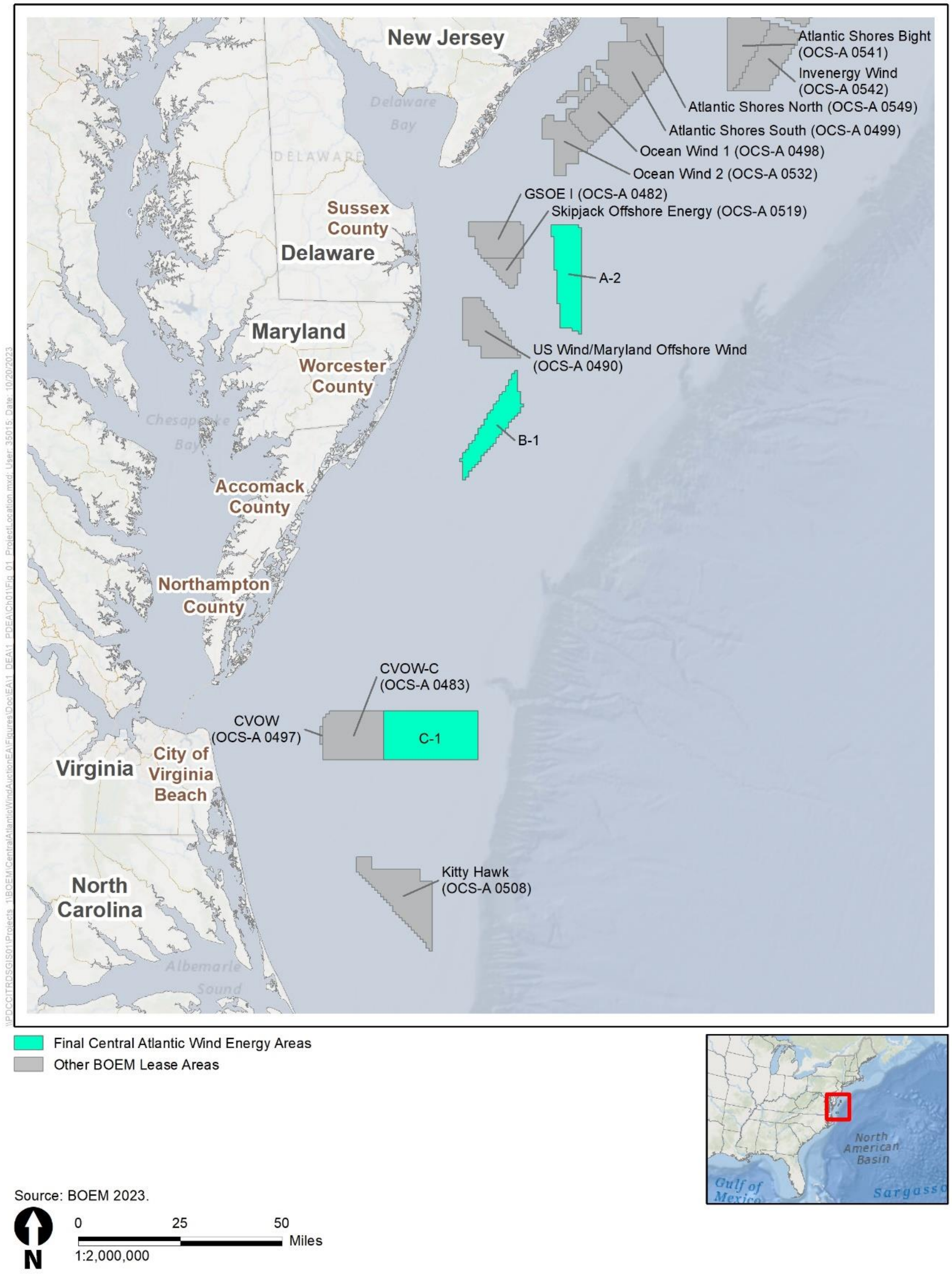
The purpose of the Proposed Action is to issue commercial leases within the WEAs and granting of rights-of-way (ROWs) and rights-of-use and easement (RUEs) in the region of the Outer Continental Shelf (OCS) of the Central Atlantic. BOEM's issuance of these leases and grants is needed to (1) confer the exclusive right to submit plans to BOEM for potential development, such that the lessees and grantees develop plans for BOEM's review and will commit to site characterization and site assessment activities necessary to determine the suitability of their leases and grants for commercial offshore wind production and/or transmission; and (2) impose terms and conditions intended to ensure that site characterization and assessment activities are conducted in a safe and environmentally responsible manner. The issuance of a lease by BOEM to the lessee conveys no right to proceed with development of a wind energy facility; the lessee acquires only the exclusive right to submit a plan to conduct this activity.

Based on the process described in the Area ID Memorandum (BOEM 2023), the WEAs considered in this Environmental Assessment (EA) are described in **Table E-1** and depicted in **Figure E-1**. For the purposes of impact assessment, BOEM is assuming lease areas of approximately 80,000 acres each, which, based on the acreage of the three WEAs, would correspond to four lease areas: one in WEA A-2, one in WEA B-1, and two in WEA C-1. BOEM has deferred WEA identification in deepwater areas at this time.

Table E-1. Central Atlantic Wind Energy Areas (WEAs) descriptive statistics

Parameter	A-2	B-1	C-1	Total
Acres	101,769	78,283	176,493	356,545
Maximum depth (m)	48	40	148	N/A
Minimum depth (m)	27	21	25	N/A
Closest distance to Delaware (nm)	26.4	24.5	87.2	N/A
Closest distance to Maryland (nm)	28.9	18.9	61.1	N/A
Closest distance to Virginia (nm)	43.4	19.0	30.9	N/A
Closest distance to North Carlina (nm)	128.3	89.9	35.4	N/A

m = meter; N/A = not applicable; nm = nautical mile



Source: BOEM 2023b

Figure E-1. Central Atlantic Wind Energy Areas

The Proposed Action for this assessment is to offer for lease all or some of the WEAs described above (**Table E-1; Figure E-1**) for commercial wind energy development and to grant ROWs and RUEs in support of wind energy development. Under the Proposed Action, BOEM would potentially issue leases that may cover the entirety of the WEAs, issue easements associated with each lease, and issue grants for subsea cable corridors and associated offshore collector/converter platforms. The ROWs, RUEs, and potential easements would all be located within the Central Atlantic and may include corridors that extend from the WEAs to the onshore energy grid. This Draft EA analyzes the reasonably foreseeable effects of activities that are anticipated to occur from the Proposed Action, including site assessment activities on leases and site characterization activities on the leases, grants, and potential easements. Site assessment activities would most likely include the temporary placement of meteorological (met) buoys and oceanographic devices. Activities included within the Proposed Action of this Draft EA do not include the installation of met towers, as met buoys have become the preferred metocean data collection platform for developers. Site characterization activities would most likely include geophysical, geotechnical, and biological surveys.

Table E-2. High-resolution geophysical survey equipment and methods

Equipment Type	Data Collection and/or Survey Types	Description of the Equipment	Line Spacing
Bathymetry/ depth sounder (multi-beam echosounder)	Bathymetric charting	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 water depths expected in the survey area. This assessment assumes the use of multi-beam bathymetry systems, which may be more appropriate than other tools for characterizing those WEAs containing complex bathymetric features or sensitive benthic habitats, such as hardbottom areas.	The lessee would likely use a multi-beam echosounder at a line spacing appropriate to the range of depths expected in the survey area.
Magnetometer	Collection of geophysical data for shallow hazards and archaeological resources assessments	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 and anticipated to be no more than approximately 6 m above the seafloor.	For the collection of geophysical data for shallow hazards assessments (including magnetometer, side-scan sonar, and seabed profiler systems), BOEM recommends surveying at a 150-m line spacing. For the collection of geophysical data for archaeological resources assessments (including magnetometers, side-scan sonar, and all seabed profiler systems), BOEM recommends surveying at a 30-m line spacing.

Equipment Type	Data Collection and/or Survey Types	Description of the Equipment	Line Spacing
Side-scan sonar	Collection of geophysical data for shallow hazards and archaeological resources assessments	This survey technique is used to evaluate surface sediments, seafloor morphology, and potential surface obstructions (MMS 2007). 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 the lessee would use a digital dual-frequency side-scan sonar system with 300–500 kHz frequency ranges or greater to record continuous planimetric images of the seafloor.	For the collection of geophysical data for shallow hazards assessments (including magnetometer, side-scan sonar, and seabed profiler systems), BOEM recommends surveying at a 150-m line spacing. For the collection of geophysical data for archaeological resources assessments (including magnetometers, side-scan sonar, and all seabed profiler systems), BOEM recommends surveying at a 30-m line spacing.
Shallow and medium (seismic) penetration seabed profilers	Collection of geophysical data for shallow hazards and archaeological resources assessments and to characterize subsurface sediments	Typically, a high-resolution CHIRP System seabed 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 seabed profiler that may be employed is a medium penetration system such as a boomer, bubble pulser, or impulse type system. Seabed profilers are capable of penetrating sediment depth ranges of 3 m to greater than 100 m, depending on frequency and bottom composition.	For the collection of geophysical data for shallow hazards assessments (including magnetometer, side-scan sonar, and sub-bottom profiler systems), BOEM recommends surveying at a 150-m line spacing. For the collection of geophysical data for archaeological resources assessments (including magnetometers, side-scan sonar, and all seabed profiler systems), BOEM recommends surveying at a 30-m line spacing.

BOEM = Bureau of Ocean Energy Management; CHIRP = Compressed High-Intensity Radiated Pulse; kHz = kilohertz; m = meter; MMS = Marine Minerals Service; WEA = Wind Energy Area.

Table E-3. Geotechnical/benthic sampling survey methods and equipment

Survey Method	Use	Description of the Equipment and Methods
Bottom-sampling devices	Penetrating depths from a few centimeters to several meters to obtain samples of soft surficial sediments	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 through the water column into the sediments, 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 allows the best possible sediment sample to be obtained by avoiding disturbance of the sample (MMS 2007). Shallow-bottom coring employs a rotary drill that penetrates through several feet of consolidated rock. Drilling produces low intensity, low frequency sound through the drill string. The above sampling methods do not use high-energy sound sources (Continental Shelf Associates Inc. 2004; MMS 2007).
Vibracores	Obtaining samples of unconsolidated sediment; may, in some cases, also be used to gather information to inform the archaeological interpretation of features identified through the HRG survey (BOEM 2020b)	Vibracore samplers typically consist of a core barrel and an oscillating driving mechanism that propels the core barrel into the seabed. 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 6 m long with 8-cm diameters are obtained, although some devices have been modified to obtain samples up to 12 m long (MMS 2007; USACE 1987).
Deep borings	Sampling and characterizing the geological properties of sediments at the maximum expected depths of the structure foundations (MMS 2007)	A drill rig is used to obtain deep borings. The drill rig is mounted on a jack-up barge supported by four "spuds" that are lowered to the seafloor. Geologic borings can generally reach depths of 30–61 m within a few days (based on weather conditions). The acoustic levels from deep borings can be expected to be in the low frequency bands and below the 160 dB threshold established by NMFS to protect marine mammals (Erbe and McPherson 2017).
CPT	Supplementing or using in place of deep borings (BOEM 2020b)	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 8 cm in diameter, with connecting rods less than 15 cm in diameter.

BOEM = Bureau of Ocean Energy Management; cm = centimeter; CPT = cone penetration test; dB = decibels; HRG = high-resolution geophysical; m = meter; MMS = Marine Minerals Service; NMFS = National Marine Fisheries Service; USACE = U.S. Army Corps of Engineers.

Table E-4. Biological survey types and methods

Biological Survey Type	Survey Guidelines	Survey Method	Timing
Benthic habitat	BOEM. (2019a). Guidelines for Providing Benthic Habitat Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585, Subpart F www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/BOEM-Renewable-Benthic-Habitat-Guidelines.pdf NMFS. (2021a). Updated Recommendations for Mapping Fish Habitat. March 29th, 2021. https://media.fisheries.noaa.gov/2021-03/March292021_NMFS_Habitat_Mapping_Recommendations.pdf?null	Bottom sediment/fauna sampling and underwater imagery/sediment profile imaging (sampling methods described above under geotechnical surveys)	Concurrent with geotechnical/benthic sampling
Avian	BOEM. (2020a). Guidelines for Providing Avian Habitat Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585 www.boem.gov/sites/default/files/documents/newsroom/Avian%20Survey%20Guidelines.pdf	Visual surveys from a boat	10 OCS blocks per day (Thaxter and Burton 2009); monthly for 2–3 years
		Plane-based aerial surveys	2 days per month for 2–3 years
Bats	None	Ultrasonic detectors installed on survey vessels being used for other biological surveys	Monthly for 3 months per year between March and November

Biological Survey Type	Survey Guidelines	Survey Method	Timing
Marine fauna (marine mammals, fish, and sea turtles)	BOEM. (2019b). Guidelines for Providing Information on Fisheries for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585 www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/BOEM-Fishery-Guidelines.pdf BOEM. (2019c). Guidelines for Providing Information on Marine Mammals and Sea Turtles for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585 www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/BOEM-Marine-Mammals-and-Sea-Turtles-Guidelines.pdf	Plane-based and/or vessel surveys—may be concurrent with other biological surveys, but would not be concurrent with any geophysical or geotechnical survey work	2 years of survey to cover spatial, temporal, and inter-annual variance in the area of potential effect
General Guidelines	BOEM. 2019. Survey Guidelines For Renewable Energy Development https://www.boem.gov/renewable-energy/survey-guidelines-renewable-energy-development BOEM. 2016a. Mid Atlantic Regional Ocean Action Plan https://www.boem.gov/sites/default/files/environmental-stewardship/Mid-Atlantic-Regional-Planning-Body/Mid-Atlantic-Regional-Ocean-Action-Plan.pdf	---	---

BOEM = Bureau of Ocean Energy Management; OCS = Outer Continental Shelf.

The timing of lease issuance, as well as weather and sea conditions, would be the primary factors influencing timing of site characterization and site assessment survey activities. Under the reasonably foreseeable site characterization scenario, the sale date is planned for July 24, 2024, and the final sale notice is to be published 45 days prior. BOEM could issue leases as early as mid- to late-2024 and continue through 2025. It is assumed lessees would begin survey activities as soon as possible after receiving a lease and preparing a Site Assessment Plan and a Survey Plan, and when sea states and weather conditions allow for site characterization and site assessment survey activities. The most suitable sea states and weather conditions would occur from April to August (Atlantic Renewable Energy Corporation and AWS Scientific Inc. 2004). For leases issued in 3Q 2024, the earliest surveys would likely begin no sooner than April 2024. Lessees have up to 5 years to perform site characterization activities before they must submit a Construction and Operations Plan (COP) (30 CFR §585.235(a)(2)). For leases issued in 4Q 2024, those lessees' surveys could continue through August 2029 prior to submitting their COPs.

E.3 EFH Presence Within the WEAs

In this section, fish and invertebrate resources expected for the Central Atlantic WEAs are characterized using softbottom, hardbottom, and pelagic ecological/habitat categories. These habitat categories are described and further characterized for offshore, nearshore, and inshore areas when possible, with special attention given to habitats with the potential to have an higher level of sensitivity to possible impacts. Within each category the composition and distribution of key resources as well as important, but lesser-known taxa are described. Detailed information for federally managed species for the Mid-Atlantic Bight and southern New England may be found in NEFMC 2017.

Species composition in the Central Atlantic project area is dynamic, with species migrating into the area from northern and southern waters in response to seasonally changing water temperatures. Because many species distributions overlap between the Mid-Atlantic and New England shelf, the WEAs fall under the jurisdiction of two regional Fishery Management Councils: MAFMC and NEFMC. In addition to these regional councils, the NMFS Highly Migratory Species Management Division, Office of Sustainable Fisheries manages billfishes, Atlantic tunas, swordfish, and sharks within a broad geographic region that encompasses the WEAs (NMFS 2017).

The assessment herein relied on formal EFH descriptions for managed species and life stages provided by MAFMC and NEFMC (MAFMC 1998a, 1998b, 1998c, 1998d; NEFMC 2017). For highly migratory species, NMFS (2017) was consulted. All of these descriptions and information were accessed initially through the Greater Atlantic Regional Fisheries Office, Habitat Conservation Division EFH habitat mapper (NMFS). This data source provided geographical distribution of various life stages of managed species as well as links to the source documents mentioned above with formal EFH descriptions. Tables were prepared listing those species and life stages whose EFH overlapped the area of interest. More comprehensive information on life history and distribution of these managed species may be found in Able and Fahy (2010), BOEM (2014), and NEFMC and NMFS (2017).

The area of interest includes EFH by life stage for 40 managed species, including 5 invertebrate taxa (**Table E-5**), 15 elasmobranch species (sharks, rays, and skates; **Table E-6**), and 20 bony fish taxa (**Table E-7**). EFH for all life stages of Atlantic sea scallop (*Placopecten magellanicus*) and inshore squid (*Doryteuthis pealeii*) are present in the project area (**Table E-5**). The pelagic inshore squid deposits egg masses on the seafloor (**Table E-5**). Atlantic sea scallops are bottom-dwelling as adults but have pelagic eggs and larvae. The bottom-dwelling ocean quahog (*Arctica islanida*) and Atlantic surfclam also release eggs into the water column, but information on egg and larval distribution is not available (**Table E-5**). Information on neonate (newborn) EFH for several shark species (e.g., common thresher, shortfin mako) is lacking for the project area, but EFH is present for neonate/juvenile sandbar shark, sand tiger shark, blue shark, dusky shark, Atlantic angel shark, tiger shark, and spiny dogfish (**Table E-6**). Skates deposit eggs on the seafloor in the project area, although little is known about habitat preferences for eggs or deposition sites. Juveniles and adults of all skate species are present in the area (**Table E-6**). EFH for all life stages (eggs, larvae, juveniles, adults) from 9 of the 20 bony fish species listed in **Table E-7** are present in the project area. Only adult and/or juvenile EFH for albacore tuna, Atlantic herring, bluefin tuna, haddock, scup, skipjack tuna, and yellowfin tuna are documented in the project area (**Table E-7**). Most of the bony fish species have pelagic eggs and larvae.

In addition to species managed under MFCMA, other National Oceanic and Atmospheric Administration (NOAA) Trust Resources—such as American lobster (*Homarus americanus*), Jonah crab (*Cancer borealis*), horseshoe crab (*Limulus polyphemus*), Atlantic menhaden (*Brevoortia tyrannus*), weakfish (*Cynoscion regalis*), American shad (*Alosa sapidissima*), river herrings (*Alosa* spp.), and Atlantic striped bass (*Morone saxatilis*)—occur in the region. These species are managed by the Atlantic States Marine Fisheries Commission. Ecologically important prey species—such as bay anchovy (*Anchoa mitchilli*), killifishes (*Fundulus* spp.), Atlantic silversides (*Menidia menidia*), sand lances (*Ammodytes* spp.), and juveniles of some managed species—are present in the inshore habitats. Analyses of impacts on managed species and EFH will nominally include these additional NOAA Trust Resources due to their economic and ecologic importance in the project area.

Spatially limited EFH called Habitat Areas of Particular Concern (HAPCs) have also been identified in the WEAs. HAPCs are selected using the following criteria:

- Importance of ecological function provided by the habitat.
- Extent to which the area or habitat is sensitive to human induced degradation.
- Whether and to what extent development activities are stressing the habitat.
- Rarity of the habitat type.

Based on these criteria, NEFMC (2017) selected as HAPCs several canyons that lie offshore of Delaware, Maryland, and Virginia including Baltimore, Wilmington, Washington, and Norfolk Canyons. These canyons occur offshore of the WEAs; however, additional HAPCs that are more relevant to sampling and assessment activities include (1) sand tiger shark (*Carcharias taurus*) pupping area in Delaware Bay; (2) sandbar shark (*Carcharhinus plumbeus*) nursery areas in Chesapeake Bay; (3) tilefish (*Lopholatilus chamaeleonticeps*) nursery areas near Norfolk Canyon; and (4) summer flounder (*Paralichthys dentatus*) submerged aquatic vegetation (SAV) nursery areas in all estuaries of the region including Chesapeake Bay and Delaware Bay. The map of HAPCs specific to individual species (**Figure E-2**) shows the potential range of where an HAPC could occur, but an HAPC is restricted to specific conditions within those ranges.

The formal descriptions of the specific conditions for sand tiger shark, sandbar shark, tilefish, and summer flounder HAPCs are as follows:

- **Sand tiger shark (Delaware Bay):** Lower portions of Delaware Bay to areas adjacent to the mouth of Delaware Bay for all life stages. The inshore extent of the HAPC reflects a line drawn from Port Mahon east to Egg Point Island (39°11'N lat.), and from Egg Point Island southeast to Bidwell Creek. The HAPC excludes an area rarely used by sand tiger sharks, which is north of a line between Egg Point Island and Bidwell Creek that includes Maurice Cove. The HAPC spans the mouth of Delaware Bay between Cape Henlopen and Cape May, and also includes adjacent coastal areas offshore of Delaware Bay and areas south (between the Indian River inlet and Cape Henlopen, Delaware).
- **Sandbar shark:** Constitutes important nursery and pupping grounds—which have been identified in shallow areas and at the mouth of Great Bay, New Jersey; in lower and middle Delaware Bay, Delaware; lower Chesapeake Bay, Maryland; and offshore of the Outer Banks, North Carolina—in water temperatures ranging from 15 to 30 degrees Celsius (°C); salinities at least from 15 to 35 parts per thousand (ppt); water depths ranging from 0.8 to 23 meters (m); and sand and mud habitats (NEFMC 2017).
- **Tilefish:** The continental slope off the Northeastern U.S. shelf is cut by more than 20 large canyons between Georges Bank and Cape Hatteras. The Norfolk Canyon is identified as tilefish HAPC and serves as a nursery (NEFMC 2017).
- **Summer flounder SAV nursery area:** All native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH. In locations where native species have been eliminated from an area, then exotic species are included (www.habitat.noaa.gov/apps/efhmapper/). Note that summer flounder SAV nursery area has not been formally mapped and therefore is not included in **Figure E-2**.

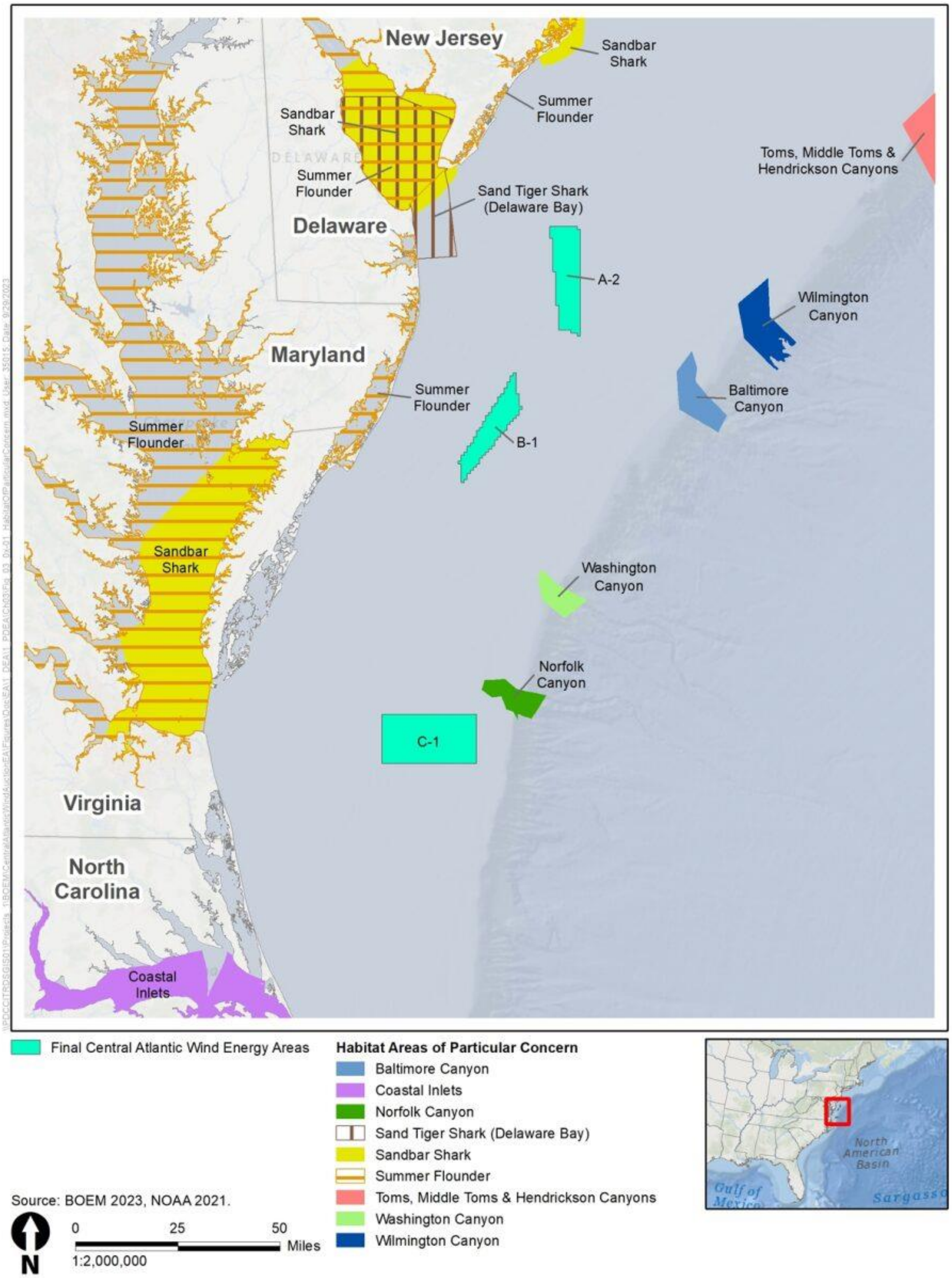


Figure E-2. Habitat Areas of Particular Concern and in the vicinity of the Central Atlantic Wind Energy Areas

Table E-5. Invertebrate species with EFH identified in the vicinity of the Central Atlantic

Species	Eggs/Larvae	Juveniles	Adults
Longfin inshore squid (*Doryteuthis pealeii*)	**Eggs**: Inshore and offshore bottom habitats from Georges Bank southward to Cape Hatteras, generally where bottom water temperatures are between 10–23°C, salinities are between 30–32 ppt, and depth is less than 50 m. Eggs have also been collected in bottom trawls in deeper water at various places on the continental shelf. Like most loliginid squids, *D. pealeii* egg masses or "mops" are demersal and anchored to the substrates on which they are laid, which include a variety of hardbottom types (e.g., shells, lobster pots, piers, fish traps, boulders, rocks), SAV (e.g., *Fucus* sp.), sand, and mud.	Pelagic habitats in inshore and offshore continental shelf waters from Georges Bank to South Carolina, in the southwestern Gulf of Maine, and in embayments such as Narragansett Bay, Long Island Sound, and Raritan Bay. EFH for recruit longfin inshore squid is generally found where bottom depths are between 6 and 160 m, bottom water temperatures are 8.5–24.5°C, and salinities are 28.5–36.5 ppt. In the fall, pre-recruits migrate offshore, where they overwinter in deeper waters along the edge of the shelf. They make daily vertical migrations, moving up in the water column at night and down in the daytime. Small immature individuals feed on planktonic organisms, while larger individuals feed on crustaceans and small fish.	Pelagic habitats in inshore and offshore continental shelf waters from Georges Bank to South Carolina, in inshore waters of the Gulf of Maine, and in embayments such as Narragansett Bay, Long Island Sound, Raritan Bay, and Delaware Bay. EFH for recruit longfin inshore squid is generally found where bottom depths are between 6 and 200 m, bottom water temperatures are 8.5–14°C, and salinities are 24–36.5 ppt. Recruits inhabit the continental shelf and upper continental slope to depths of 400 m. They migrate offshore in the fall and overwinter in warmer waters along the edge of the shelf. Like the pre-recruits, they make daily vertical migrations. Individuals larger than 12 cm feed on fish, and those larger than 16 cm feed on fish and squid. Females deposit eggs in gelatinous capsules, which are attached in clusters to rocks, boulders, and aquatic vegetation and on sand or mud bottom, generally in depths less than 50 m.
Northern shortfin squid (*Illex illecebrosus*)	N/A	Pelagic waters of the continental shelf from the Gulf of Maine through Cape Hatteras, North Carolina, from shore to 183 m water depths, where water temperatures range from 2.2–22.8°C.	Pelagic waters of the continental shelf from the Gulf of Maine through Cape Hatteras, North Carolina, from shore to 183 m water depths in temperatures ranging between 3.8 and 19°C.

Species	Eggs/Larvae	Juveniles	Adults
Atlantic sea scallop (*Placopecten magellanicus)*	**Eggs:** Benthic habitats in inshore areas and on the continental shelf in the vicinity of adult scallops. Eggs are heavier than seawater and remain on the seafloor until they develop into the first free-swimming larval stage. **Larvae:** Benthic and water column habitats in inshore and offshore areas throughout the region. Any hard surface can provide an essential habitat for settling pelagic larvae ("spat"), including shells, pebbles, and gravel. They also attach to macroalgae and other benthic organisms such as hydroids.	Benthic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic, in depths of 18–110 m. Juveniles (5–12 mm shell height) leave the original substrate on which they settle (see spat, adjacent) and attach themselves by byssal threads to shells, gravel, and small rocks (pebble, cobble), preferring gravel. Juvenile scallops are relatively active and swim to escape predation. While swimming, they can be carried long distances by currents. Bottom currents stronger than 10 cm/sec retard feeding and growth. Essential habitats for older juvenile scallops are the same as for the adults (gravel and sand).	Benthic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic. Essential habitats for adult sea scallops are found on sand and gravel substrates in depths of 18–110 m. In the Mid-Atlantic, they are found primarily between 45 and 75 m. They often occur in aggregations called beds, which may be sporadic or essentially permanent, depending on how suitable the habitat conditions are (temperature, food availability, and substrate) and whether oceanographic features (fronts, currents) exist in the area. Bottom currents stronger than 25 cm/sec (half a knot) inhibit feeding. Growth of adult scallops is optimal between 10 and 15°C in areas of normal salinity.
Surfclam (*Spisula solidissimus*)	N/A	Surfclam juveniles occur throughout the substrate, to a depth of 1 m below the water/sediment interface, within Federal waters from the eastern edge of Georges Bank and the Gulf of Maine throughout the Atlantic EEZ. Surfclams generally occur from the beach zone to a depth of about 61 m, but abundance is low beyond about 38 m.	See *Juveniles.*
Ocean quahog (*Arctica islandica*)	N/A	Throughout the substrate, to a depth of 1 m below the water/sediment interface, within Federal waters from the eastern edge of Georges Bank and the Gulf of Maine throughout the Atlantic EEZ. Distribution in the western Atlantic ranges in depths from 9.1 m to about 244 m. Ocean quahogs are rarely found where bottom water temperatures exceed 16°C.	See *Juveniles.*

Sources: MAFMC 1998b; 1998c; NEFMC 2017.

°C = degrees Celsius; cm = centimeter; cm/sec = centimeters per second; EEZ = Exclusive Economic Zone; m = meters; EFH = Essential Fish Habitat; MAFMC = Mid-Atlantic Fishery Management Council; mm = millimeter; N/A = not applicable; NMFS = National Marine Fisheries Service; ppt = parts per thousand; SAV = submerged aquatic vegetation.

Table E-6. Shark and skate species and life stages with EFH identified within the project area

Species	Neonate/ Early Juveniles	Late Juveniles/ Subadults	Adults
Atlantic angel shark (*Squatina dumeril*)	Neonate EFH in the Atlantic Ocean includes continental shelf habitats from Cape May, New Jersey to Cape Lookout, North Carolina.	Insufficient data are available to differentiate EFH between the juvenile and adult size classes; therefore, EFH is the same for those life stages. EFH in the Atlantic Ocean includes continental shelf habitats from Cape May, New Jersey to Cape Lookout, North Carolina.	See *Juveniles*.
Atlantic sharpnose shark Atlantic stock	N/A	EFH for juveniles extends from portions of the lower Chesapeake Bay (Virginia) to the mid-coast of Florida, with seasonal summer distribution in the northern part of the range.	EFH for adults extends from portions of Delaware Bay and Cape May, New Jersey, to the mid-coast of Florida, including portions of Chesapeake Bay, with seasonal summer distribution in the northern part of the range. Offshore depth extent for adults is 180 m.
Blacktip shark		Insufficient data are available to differentiate EFH between the juvenile and adult size classes; therefore, EFH is the same for those life stages. EFH is in the Atlantic coastal areas from Florida to the Maryland/Virginia line (northern extent of EFH is Chincoteague Island), including the mouth of Chesapeake Bay.	See *Late Juveniles*.
Common thresher shark (*Alopias vulpinus*)	Neonate EFH in the Atlantic includes continental shelf habitats from Cape May, New Jersey, to Cape Lookout, North Carolina.	Insufficient data are available to differentiate EFH between the juvenile and adult size classes; therefore, EFH is the same for those life stages. EFH is located in the Atlantic Ocean, from Georges Bank (at the offshore extent of the U.S. EEZ boundary) to Cape Lookout, North Carolina; and from Maine to locations offshore of Cape Ann, Massachusetts.	See *Late Juveniles*.
Shortfin mako *(Isurus oxyrinchus)*	See *Late Juveniles*.	Insufficient data are available for the identification of EFH by life stage; therefore, all life stages are combined in the EFH designation. EFH in the Atlantic Ocean includes pelagic habitats seaward of the continental shelf break between the seaward extent of the U.S. EEZ boundary on Georges Bank	See *Late Juveniles*.

Species	Neonate/ Early Juveniles	Late Juveniles/ Subadults	Adults
		(off Massachusetts) to Cape Cod (seaward of the 200-m bathymetric line).	
Sand tiger shark (*Carcharias taurus*)	Neonate EFH ranges from Massachusetts to Florida, specifically the Plymouth, Kingston, Duxbury Bay system, Sandy Hook, and Narragansett Bay, as well as coastal sounds, lower Chesapeake Bay, Delaware Bay (and adjacent coastal areas).	Juveniles EFH includes habitats between Massachusetts and New York (notably the Plymouth, Kingston, Duxbury Bay system), and between mid-New Jersey and the mid-east coast of Florida. EFH can be described via known habitat associations in the lower Chesapeake Bay and Delaware Bay (and adjacent coastal areas) where temperatures range from 19–25°C, salinities range from 23–30 ppt, and depths range from 2.8–7.0 m, and in sand and mud areas.	In the Atlantic along the mid-east coast of Florida (Cape Canaveral) through Delaware Bay. Important habitats include lower Chesapeake Bay and Delaware Bay (and adjacent coastal areas), where sand tiger sharks spend 95% of their time in waters between 17 and 23°C.
Sandbar shark (*Carcharhinus plumbeus)*	Atlantic coastal areas from Long Island, New York, to Cape Lookout, North Carolina. Important neonate/young-of-the-year EFH includes: Delaware Bay (Delaware and New Jersey) and Chesapeake Bay (Virginia and Maryland), where the nursery habitat is limited to the southeastern portion of the estuaries (salinity is greater than 20.5 ppt and depth is greater than 5.5 m); Great Bay, New Jersey. In all nursery areas between New York and North Carolina, EFH is associated with water temperatures ranging from 15–30°C; salinities ranging from 15–35 ppt; water depths ranging from 0.8–23 m; and sand, mud, shell, and rocky sediments/benthic habitat.	EFH includes coastal portions of the Atlantic Ocean between southern New England (Nantucket Sound, Massachusetts) and Georgia in water temperatures ranging from 20–24°C and depths from 2.4–6.4 m. Important nurseries include Delaware Bay, Delaware and New Jersey; Chesapeake Bay, Virginia; Great Bay, New Jersey; and the waters off Cape Hatteras, North Carolina. For all EFH, water temperatures range from 15–30°C; salinities range from 15–35 ppt; water depth ranges from 0.8–23 m; and substrate includes sand, mud, shell, and rocky habitats.	EFH in the Atlantic Ocean includes coastal areas from southern New England to the Florida Keys, ranging from inland waters of Delaware Bay and the mouth of Chesapeake Bay to the continental shelf break.

Species	Neonate/ Early Juveniles	Late Juveniles/ Subadults	Adults
Dusky shark (*Carcharhinus obscurus*)	EFH in the Atlantic Ocean includes offshore areas of southern New England to Cape Lookout, North Carolina. Specifically, EFH is associated with habitat conditions including temperatures from 18.1–22.2°C, salinities of 25–35 ppt, and depths at 4.3–15.5 m. Seaward extent of EFH for this life stage in the Atlantic is 60 m in depth.	Coastal and pelagic waters inshore of the continental shelf break (<200 m in depth) along the Atlantic East Coast from habitats offshore of southern Cape Cod to Georgia, including the Charleston Bump and adjacent pelagic habitats. Inshore extent for these life stages is the 20-m bathymetric line, except in habitats of southern New England, where EFH is extended seaward of Martha's Vineyard, Block Island, and Long Island. Pelagic habitats of southern Georges Bank and the adjacent continental shelf break from Nantucket Shoals and the Great South Channel to the eastern boundary of the U.S. EEZ. Adults are generally found deeper (to 2,000 m) than juveniles; however, there is overlap in the habitats utilized by both life stages.	See *Late Juveniles.*
Tiger shark (*Gaelocerdo cuvier*)	N/A	EFH in the Atlantic Ocean extends from offshore pelagic habitats associated with the continental shelf break at the seaward extent of the U.S. EEZ boundary (south of Georges Bank, off Massachusetts) to the Florida Keys, inclusive of offshore portions of the Blake Plateau.	See *Late Juveniles*.
Blue shark (*Prionace glauca*)	N/A	Localized areas in the Atlantic Ocean in the Gulf of Maine, from Georges Bank to North Carolina, South Carolina, Georgia, and off Florida.	See *Late Juveniles.*
Spiny dogfish (*Squalus acanthias*)	N/A	Pelagic and epibenthic habitats throughout the region. Sub-adult females are found over a wide depth range in full salinity seawater (32–35 ppt), where bottom temperatures range from 7–15°C. Sub-adult females are widely distributed throughout the region in the winter and spring, when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 15°C.	See *Late Juveniles*.

Species	Neonate/ Early Juveniles	Late Juveniles/ Subadults	Adults
Smoothound shark Complex Atlantic stock	See *Late Juveniles*.	At this time, available information is insufficient for the identification of EFH for this life stage; therefore, all life stages are combined in the EFH designation. Smoothhound shark EFH identified in the Atlantic is exclusively for smooth dogfish. EFH in Atlantic coastal areas ranges from Cape Cod Bay, Massachusetts to South Carolina, inclusive of inshore bays and estuaries. EFH also includes continental shelf habitats between southern New Jersey and Cape Hatteras, North Carolina.	See *Late Juveniles*.
Clearnose skate (*Raja eglanteria*)	N/A	EFH for juvenile clearnose skates occurs from the shoreline to 30 m in depth, primarily on mud and sand, but also on gravelly and rocky bottom.	EFH for adult clearnose skates occurs from the shoreline to 40 m in depth, primarily on mud and sand, but also on gravelly and rocky bottom.
Little skate (*Leucoraja erinacea*)	N/A	EFH for juvenile little skates occurs on sand and gravel substrates, but they are also found on mud.	EFH for adult little skates occurs on sand and gravel substrates, but they are also found on mud.
Winter skate (*Leucoraja ocellata*)	N/A	EFH for juvenile winter skates occurs on sand and gravel substrates, but they are also found on mud.	EFH for adult winter skates occurs on sand and gravel substrates, but they are also found on mud.

Sources: MAFMC 2014; NMFS 2017.

°C = degrees Celsius; EEZ = Exclusive Economic Zone; EFH = Essential Fish Habitat; m = meters; MAFMC = Mid-Atlantic Fishery Management Council; N/A = not applicable; NMFS = National Marine Fisheries Service ppt = parts per thousand.

Table E-7. Bony fish species by life stages with EFH identified within project area

Species	Eggs and Larvae	Juveniles/Subadults	Adults
Monkfish (*Lophius americanus*)	**Eggs and Larvae:** Pelagic habitats in inshore areas, and on the continental shelf and slope throughout the region. Monkfish eggs are shed in very large buoyant mucoidal egg "veils." Monkfish larvae are more abundant in the Mid-Atlantic region and occur over a wide depth range, from the surf zone to depths of 1,000–1,500 m on the continental slope.	Sub-tidal benthic habitats in depths of 50–400 m in the Mid-Atlantic, between 20 and 400 m in the Gulf of Maine, and to a maximum depth of 1,000 m on the continental slope. A variety of habitats are essential for juvenile monkfish, including hard sand, pebbles, gravel, broken shells, and soft mud; they also seek shelter among rocks with attached algae. YOY juveniles have been collected primarily on the central portion of the shelf in the Mid-Atlantic, but also in shallow nearshore waters off eastern Long Island, up the Hudson Canyon shelf valley, and around the perimeter of Georges Bank. They have also been collected as deep as 900 m on the continental slope.	N/A
Atlantic herring (*Clupea harengus*)	N/A	Intertidal and sub-tidal pelagic habitats to 300-m depths throughout the region, including bays and estuaries. One- and two-year-old juveniles form large schools and make limited seasonal inshore-offshore migrations. Older juveniles are usually found in water temperatures of 3–15°C in the northern part of their range and as high as 22°C in the Mid-Atlantic. YOY juveniles can tolerate low salinities, but older juveniles avoid brackish water.	Sub-tidal pelagic habitats with maximum depths of 300 m throughout the region, including bays and estuaries. Adults make extensive seasonal migrations between summer and fall spawning grounds on Georges Bank and the Gulf of Maine and overwintering areas in southern New England and the Mid-Atlantic region. They seldom migrate beyond a depth of about 100 m and unless they are preparing to spawn, and they usually remain near the surface. They generally avoid water temperatures above 10°C and low salinities. Spawning takes place on the bottom, generally in depths of 5–90 m on a variety of substrates (see *Eggs*).
Scup (*Stenotomus chrysops*)	N/A	**Offshore:** EFH is the demersal waters over the continental shelf (from the coast out to	**Offshore:** EFH is the demersal waters over the continental shelf (from the coast out to

Species	Eggs and Larvae	Juveniles/Subadults	Adults
		the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina. **Inshore:** EFH includes "mixing" and "seawater" salinity zones of estuaries. In general during the summer and spring juvenile scup are found in estuaries and bays between Virginia and Massachusetts in association with various sands, mud, mussel, and eelgrass bed type substrates and in water temperatures greater than 7.2°C and salinities greater than 15 ppt.	the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina. **Inshore:** EFH is the "mixing" and "seawater" salinity zones of estuaries. Generally, wintering adults (November through April) are usually offshore, south of New York to North Carolina, in waters above 7.2°C.
Black seabass (*Centropristis striatus*)	**Eggs:** EFH is the "mixing" and "seawater" salinity zones of estuaries. Generally, black seabass eggs are found from May through October on the continental shelf, from southern New England to North Carolina. **Larvae:** North of Cape Hatteras, EFH is the pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina. Generally, the habitats for the transforming larvae (to juveniles) are near the coastal areas and into marine parts of estuaries between Virginia and New York. When larvae become demersal, they are generally found on structured inshore habitat such as sponge beds.	**Offshore:** EFH is the demersal waters over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina. **Inshore:** EFH is the "mixing" and "seawater" salinity zones of estuaries. Juveniles are found in the estuaries in the summer and spring. Generally, juvenile black seabass are found in waters warmer than 6°C with salinities greater than 18 ppt and coastal areas between Virginia and Massachusetts, but they winter offshore from New Jersey and south. Juvenile black seabass are usually found in association with rough bottom, shellfish, and eelgrass beds and human-made structures in sandy shelly areas; offshore clam beds and shell patches may also be used during the wintering.	**Offshore:** EFH is the demersal waters over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina. **Inshore:** EFH is estuaries. Black seabass are generally found in estuaries from May through October. Wintering adults (November through April) are generally offshore, south of New York to North Carolina. Temperatures above 6°C seem to be the minimum requirements. Structured habitats (natural and human-made), sand, and shell are usually the substrate preference.
Atlantic cod (*Gadus morhua*)	**Eggs:** Pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region, and in the high salinity zones of the bays and estuaries. **Larvae:** Pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region,	N/A	N/A

Species	Eggs and Larvae	Juveniles/Subadults	Adults
	and in the high salinity zones of bays and estuaries.		
Haddock (*Melanogrammus aeglefinus*)		Sub-tidal benthic habitats at depths between 40 and 140 m in the Gulf of Maine, on Georges Bank and in the Mid-Atlantic region, and as shallow as 20 m along the coast of Massachusetts, New Hampshire, and Maine. EFH for adult haddock occurs on hard sand (particularly smooth patches between rocks), mixed sand and shell, gravelly sand, and gravel. YOY juveniles settle on sand and gravel on Georges Bank, but are found predominantly on gravel pavement areas within a few months after settlement. As they grow, they disperse over a greater variety of substrate types on the bank. YOY haddock do not inhabit shallow, inshore habitats.	
Pollock (*Pollachius virens*)	**Larvae**: Pelagic inshore and offshore habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region, including the bays and estuaries.		
Silver hake (*Merluccius bilinearis*)	**Eggs and Larvae:** Pelagic habitats from the Gulf of Maine to Cape May, New Jersey, including Cape Cod and Massachusetts Bays.	Pelagic and benthic habitats in the Gulf of Maine, including coastal bays and estuaries and on the continental shelf as far south as Cape May, New Jersey; at depths greater than 10 m in coastal waters in the Mid-Atlantic; and at depths between 40 and 400 m in the Gulf of Maine, on Georges Bank, and in the middle continental shelf in the Mid- Atlantic, on sandy substrates. Juvenile silver hake are found in association with sand waves, flat sand with amphipod tubes and shells, and in biogenic depressions. Juveniles in the NY Bight settle to the bottom at mid-shelf depths on	Pelagic and benthic habitats at depths greater than 35 m in the Gulf of Maine and coastal bays and estuaries; between 70 and 400 m on Georges Bank and the OCS in the northern portion of the Mid-Atlantic Bight; and in some shallower locations nearer the coast, on sandy substrates. Adult silver hake are often found in bottom depressions or in association with sand waves and shell fragments. They have also been observed at high densities in mud habitats bordering deep boulder reefs, resting on boulder surfaces, and foraging over deep boulder reefs in the southwestern Gulf of Maine. This

Species	Eggs and Larvae	Juveniles/Subadults	Adults
		muddy sand substrates and find refuge in amphipod tube mats.	species makes greater use of the water column (for feeding, at night) than red or white hake.
Red hake (*Urophycis chuss*)	**Eggs and Larvae:** Pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic, and in bays and estuaries.	Intertidal and sub-tidal benthic habitats throughout the region on mud and sand substrates to a maximum depth of 80 m, including bays and estuaries. Bottom habitats providing shelter are essential for juvenile red hake, including mud substrates with biogenic depressions, substrates providing biogenic complexity (e.g., eelgrass, macroalgae, shells, anemone, polychaete tubes), and artificial reefs. Newly settled juveniles occur in depressions on the open seabed. Older juveniles are commonly associated with shelter or structure and often inside live bivalves.	Benthic habitats in the Gulf of Maine and the OCS and slope in depths of 50 to 750 m and as shallow as 20 m in a number of inshore estuaries and embayments as far south as Chesapeake Bay. Shell beds, soft sediments (mud and sand), and artificial reefs provide essential habitats for adult red hake. They are usually found in depressions in softer sediments or in shell beds and not on open sandy bottom. In the Gulf of Maine, they are much less common on gravel or hardbottom, but they are reported to be abundant on hardbottoms in temperate reef areas of Maryland and northern Virginia.
Summer flounder (*Paralichthys dentatus*)	**Eggs:** North of Cape Hatteras, EFH is the pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ) from the Gulf of Maine to Cape Hatteras, North Carolina. In general, summer flounder eggs are found between October and May, and are most abundant between Cape Cod and Cape Hatteras, with the heaviest concentrations within 9 miles (14 km) of shore off New Jersey and New York. Eggs are most commonly collected at depths of 10–110 m. **Larvae:** North of Cape Hatteras, EFH is the pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ) from the Gulf of Maine to Cape Hatteras, North Carolina, in nearshore waters (out to 80 km [50 miles] from shore). Inshore, EFH is the "mixing" (0.5–25.0 ppt) and "seawater" (>25 ppt) salinity zones of estuaries. In general, summer flounder	North of Cape Hatteras, EFH is the demersal waters over the continental shelf (from the coast out to the limits of the EEZ) from the Gulf of Maine to Cape Hatteras, North Carolina. In inshore waters EFH includes the "mixing" and "seawater" salinity zones of estuaries. In general, juveniles use several estuarine habitats as nursery areas, including salt marsh creeks, seagrass beds, mudflats, and open bay areas in water temperatures greater than 37°C and salinities ranging 10–30 ppt.	North of Cape Hatteras, EFH is the demersal waters over the continental shelf (from the coast out to the limits of the EEZ) from the Gulf of Maine to Cape Hatteras, North Carolina. In inshore waters EFH is the "mixing" and "seawater" salinity zones of estuaries. Generally, summer flounder inhabit shallow coastal and estuarine waters during warmer months and move offshore on the OCS at depths of 150 m in colder months.

Species	Eggs and Larvae	Juveniles/Subadults	Adults
	larvae are most abundant nearshore (20–80 km [12-50 miles] from shore) at depths between 10 and 80 m. They are most frequently found in the northern part of the Mid-Atlantic Bight from September to February, and in the southern part from November to May.		
Windowpane flounder (*Scophthalmus aquosus*)	**Eggs and Larvae:** Pelagic habitats on the continental shelf from Georges Bank to Cape Hatteras and in mixed and high salinity zones of coastal bays and estuaries throughout the region.	Intertidal and sub-tidal benthic habitats in estuarine, coastal marine, and continental shelf waters from the Gulf of Maine to northern Florida, including mixed and high salinity zones in bays and estuaries. EFH for juvenile windowpane flounder is found on mud and sand substrates and extends from the intertidal zone to a maximum depth of 60 m. YOY juveniles prefer sand over mud.	Intertidal and sub-tidal benthic habitats in estuarine, coastal marine, and continental shelf waters from the Gulf of Maine to Cape Hatteras, including mixed and high salinity zones in bays and estuaries. EFH for adult windowpane flounder is found on mud and sand substrates and extends from the intertidal zone to a maximum depth of 70 m.
Witch flounder (*Glyptocephalus cynoglossus*)	Pelagic habitats on the continental shelf throughout the Northeast region.	Sub-tidal benthic habitats at depths between 50 and 400 m in the Gulf of Maine and as deep as 1,500 m on the OCS and slope, with mud and muddy sand substrates.	Sub-tidal benthic habitats at depths between 35 and 400 m in the Gulf of Maine and as deep as 1,500 m on the OCS and slope, with mud and muddy sand substrates.
Yellowtail flounder (*Pleuronectes ferruginea*)	**Eggs:** Coastal and continental shelf pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region as far south as the upper Delmarva peninsula, including the high salinity zones of bays and estuaries. **Larvae**: Coastal marine and continental shelf pelagic habitats in the Gulf of Maine, and from Georges Bank to Cape Hatteras, including the high salinity zones of bays and estuaries.	Sub-tidal benthic habitats in coastal waters in the Gulf of Maine and on the continental shelf on Georges Bank and in the Mid-Atlantic, including the high salinity zones of bays and estuaries. EFH for juvenile yellowtail flounder occurs on sand and muddy sand at depths between 20 and 80 m. In the Mid- Atlantic, YOY juveniles settle to the bottom on the continental shelf, primarily at depths of 40–70 m, on sandy substrates.	Sub-tidal benthic habitats in coastal waters in the Gulf of Maine and on the continental shelf on Georges Bank and in the Mid-Atlantic, including the high salinity zones of bays and estuaries. EFH for adult yellowtail flounder occurs on sand and sand with mud, shell hash, gravel, and rocks at depths between 25 and 90 m.
Atlantic mackerel (*Scomber scombrus*)	**Eggs:** EFH for Atlantic mackerel eggs is generally found over bottom depths of 100 m or less with average water temperatures of 6.5 to 12.5°C in the upper 15 m of the water column. **Larvae:** EFH is pelagic habitats in inshore estuaries and embayments from Great Bay, New	EFH is pelagic habitats in inshore estuaries and embayments from Great Bay, New Hampshire, to the south shore of Long Island, New York, inshore and offshore waters of the Gulf of Maine, and on the continental shelf from Georges Bank to	EFH is pelagic habitats in inshore estuaries and embayments from Passamaquoddy Bay, Maine, to the Hudson River, and on the continental shelf from Georges Bank to Cape Hatteras, North Carolina. EFH for adult Atlantic mackerel is generally found over

Species	Eggs and Larvae	Juveniles/Subadults	Adults
	Hampshire, to the south shore of Long Island, New York, inshore and offshore waters of the Gulf of Maine, and on the continental shelf from Georges Bank to Cape Hatteras, North Carolina (mostly north of 38°N).	Cape Hatteras, North Carolina (mostly north of 38°N).	bottom depths less than 170 m and in water temperatures of 5–20°C.
Atlantic butterfish (*Peprilus triacanthus*)	**Eggs:** EFH for Atlantic butterfish eggs are generally found over bottom depths of 1,500 m or less, where average temperatures in the upper 200 m of the water column are 6.5–21.5°C. **Larvae:** EFH is pelagic habitats in inshore estuaries and embayments from Massachusetts Bay to the south shore of Long Island, New York, in Chesapeake Bay, and on the continental shelf and slope, primarily from Georges Bank to Cape Hatteras, North Carolina.	EFH is pelagic habitats in inshore estuaries and embayments from Massachusetts Bay to Pamlico Sound, North Carolina; inshore waters of the Gulf of Maine and the South Atlantic Bight; on Georges Bank; on the inner continental shelf south of Delaware Bay; and on the OCS from southern New England to South Carolina. EFH for adult Atlantic butterfish is generally found over bottom depths between 10 and 250 m, where bottom water temperatures are between 4.5 and 27.5°C and salinities are above 5 ppt.	See *Juveniles.*
Bluefish (*Pomatomus saltatrix*)	**Eggs:** North of Cape Hatteras, pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ) at mid-shelf depths, from Montauk Point, New York, south to Cape Hatteras in the pelagic waters over the continental shelf (from the coast out to the eastern wall of the Gulf Stream). Bluefish eggs are generally not collected in estuarine waters, and thus there is no EFH designation inshore. Generally, bluefish eggs are collected from April through August in temperatures greater than 18°C and normal shelf salinities (>31 ppt). **Larvae:** North of Cape Hatteras, pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ) most commonly above 15 m, from Montauk Point south to Cape Hatteras.	North of Cape Hatteras, pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ) from Nantucket Island, Massachusetts, south to Cape Hatteras, North Carolina. Atlantic estuaries from May through October, and South Atlantic estuaries March through December, within the “mixing” and “seawater” zones.	North of Cape Hatteras, over the continental shelf (from the coast out to the limits of the EEZ) from Cape Cod Bay, Massachusetts, south to Cape Hatteras.

Species	Eggs and Larvae	Juveniles/Subadults	Adults
Albacore tuna (*Thunnus alalunga*)	N/A	Offshore, pelagic habitats of the Atlantic Ocean from the outer edge of the U.S. EEZ through Georges Bank to pelagic habitats south of Cape Cod, and from Cape Cod to Cape Hatteras, North Carolina.	N/A
Bluefin tuna (*Thunnus thynnus*)	This life stage has been expanded into two areas of the Slope Sea (off the shelf between North Carolina and Georges Bank, north of the Gulf Stream) due to the presence of extremely young larvae. One area encompasses pelagic habitats on and off the continental shelf (off the coast of North Carolina) and extends to the shoreline between the North Carolina/Virginia line and Oregon Inlet. The other area includes pelagic waters of the Slope Sea, extending to the outer United States' EEZ south of Georges Bank.	Coastal and pelagic habitats of the Mid-Atlantic Bight and the Gulf of Maine, between southern Maine and Cape Lookout, from shore (excluding Long Island Sound, Delaware Bay, Chesapeake Bay, and Pamlico Sound) to the continental shelf break. EFH in coastal areas of Cape Cod are located between the Great South Passage and shore. EFH follows the continental shelf from the outer extent of the U.S. EEZ on Georges Bank to Cape Lookout. EFH is associated with certain environmental conditions in the Gulf of Maine (16–19°C; 0–40 m deep). EFH in other locations associated with temperatures ranging from 4–26°C, often in depths of less than 20 m (but can be found in waters that are 40–100 m in depth in winter).	EFH is located in offshore and coastal regions of the Gulf of Maine from the mid-coast of Maine to Massachusetts; on Georges Bank; offshore pelagic habitats of southern New England; and from southern New England to coastal areas between the mouth of Chesapeake Bay and Onslow Bay, North Carolina.
Yellowfin tuna (*Thunnus albacares*)	N/A	Offshore pelagic habitats seaward of the continental shelf break between the seaward extent of the U.S. EEZ boundary on Georges Bank and Cape Cod, Massachusetts. Offshore and coastal habitats from Cape Cod to the mid-east coast of Florida and the Blake Plateau.	See *Juveniles.*
Skipjack tuna (*Katsuwonus pelamis*)	N/A	Offshore pelagic habitats seaward of the continental shelf break between the seaward extent of the U.S. EEZ boundary and the seaward margin of Georges Bank (off Massachusetts); coastal and offshore habitats between Massachusetts and South Carolina.	Coastal and offshore habitats between Massachusetts and Cape Lookout, North Carolina, and localized areas in the Atlantic off South Carolina and Georgia, as well as the northern east coast of Florida.

Sources: MAFMC 1998c; 1998d; 2011; 2014; NEFMC 2017; NMFS 2017.
°C = degrees Celsius; EEZ = Exclusive Economic Zone; EFH = Essential Fish Habitat; km = kilometers; m = meters; MAFMC = Mid-Atlantic Fishery Management Council; N/A = not applicable; NEFMC = New England Fishery Management Council; NMFS = National Marine Fisheries Service; OCS = Outer Continental Shelf; ppt = parts per thousand; YOY = young-of-the-year.

E.4 Analysis of Effects

The purpose of this section is to evaluate if the Proposed Action would have an adverse effect on EFH, including managed and associated species, at the WEAs and potential transmission cable routes. The EFH rules define an adverse effect as "any impact which reduces quality and/or quantity of EFH...[and] may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site-specific or habitat wide impacts, including individual, cumulative, or synergistic consequences of actions."

Three types of habitat are included in this analysis: soft bottom benthic, hardbottom benthic, and pelagic (water column). As mentioned above, site assessment activities would most likely include the temporary placement of metocean buoys. Site characterization activities would most likely include geophysical and geotechnical, biological, and oceanographic surveys. Impacts of high-resolution geophysical (HRG) surveys on the water column habitat would be localized and transient, with no significant adverse effect on EFH for any pelagic species. Minor disturbance of soft bottom benthic habitats is expected where met buoys are placed and where geotechnical (bottom samples, deep borings, vibracores, cone penetrometers) and biological sampling (e.g., benthic grabs, bottom trawls, gillnets, ventless traps) may occur. Potential adverse effects resulting from habitat modification and/or loss are expected to be minor due to the small spatial footprint of these activities and rapid re-colonization time of benthic species located in shallow (<20 m) habitats (Newell et al. 1998, Bolam and Rees 2003). Hardbottom habitats would be avoided through the site selection and mapping process, and no adverse effects on these habitats are anticipated.

Equipment used during site characterization and site assessment activities (e.g., towed HRG survey equipment, cone penetration test [CPT] components, grab sampler, buoys, lines, cables) could be accidentally lost during survey operations. Additionally, it is possible (although unlikely) that the met buoy could disconnect from the clump anchor. In the event of lost equipment, recovery operations may be undertaken to retrieve the equipment. Recovery operations may be performed in a variety of manners depending on the equipment lost. A commonly used method for retrieval of lost equipment on the seafloor is through dragging grapnel lines (e.g., hooks, trawls). A single vessel deploys a grapnel line to the seafloor and drags it along the bottom until it catches the lost equipment, which is then brought to the surface for recovery. This process can result in significant bottom disturbances as it requires dragging the grapnel line along the bottom until it hooks the lost equipment, which may require multiple passes in a given area. In addition to dragging a grapnel line along the bottom, after the line catches the lost equipment, it would drag all the components along the seafloor until recovery.

Where lost survey equipment is not able to be retrieved because it is either small, buoyant enough to be carried away by currents, or is completely or partially embedded in the seafloor (for example, a broken vibracore), the equipment may become a potential hazard for bottom-tending fishing gear or cause additional bottom disturbance. For example, a broken vibracore that cannot be retrieved may need to be cut and capped 1 to 2 m below the seafloor. For the recovery of lost survey equipment, BOEM will work with the lessee/operator to develop an emergency response plan. Selection of a mitigation strategy will depend on the nature of the lost equipment, and further consultation may be necessary.

BOEM assumes that during site characterization, a lessee would survey potential transmission cable routes (for connecting future wind turbines to an onshore power substation) from the WEAs to shore using similar site assessments to those described above. BOEM assumes that survey grids for a proposed transmission cable route to shore would likely occur over a 1,000-m-wide corridor centered on the potential transmission cable location. These cable routes would traverse inshore habitats, but at present specific locations are not known. Inshore habitats (soft bottom, SAV, emergent vegetation including salt marshes) represented in bays, estuaries, and river mouths of the project area support various life stages of managed species and their prey. These habitats include HAPCs for juvenile summer flounder, sand tiger sharks, sandbar sharks, and tilefish (**Figure E-2**).

Biological surveys—primarily fishery surveys, including trawl, gillnet, ventless trap, and shellfish surveys—but also placement of fixed gear and passive acoustic monitoring mooring equipment, and the use of sediment profile and plan view imaging equipment would likely result in some direct mortality to finfish and invertebrates. This would include some federally managed species or their prey. There would also be some benthic disturbance and direct mortality to benthic species. However, the dispersed nature of biological survey-related vessel traffic and limited number of surveys reduces the potential for repeated disturbances (Baker and Howson 2021). Generally, methodologies employed in fisheries surveys include returning most of the animals back to the sea as quickly as possible. Nevertheless, sub-sampling and other trauma is expected to result in some mortality; BOEM recognizes that some fisheries surveys could impact listed species under the ESA. This mortality is anticipated to be undetectable within the overall fishery management regime described in **Section 3.3.3** of the EA, and lasting adverse impacts on EFH are not expected.

E.4.1 Soft Bottom Benthic Habitat

The region of interest includes nearshore and offshore sub-tidal subsystems of the continental shelf from the shoreline of the coast to the shelf edge (~100-m water depths). The primary substrate is unconsolidated sediment, as the shelf is overlain mostly by medium-grained sand (0.25 to <0.5 millimeter [mm]). Some discrete patches with different sedimentary compositions exist within the region. Most notably, there are areas of muddy sand to mud (< 0.0625 mm) and gravelly sand to gravel (2 to < 4,096 mm). The medium sand is arranged as a level plain or as ripples and megaripples generally oriented southwest to northeast. Sand waves (ripples) may be 1 to 2 m high at intervals of 2 to 5 kilometers (km) (Guida et al. 2017). The unconsolidated substrates support deep burrowing fauna, small surface burrowing fauna, larger tube-building fauna, scallop beds, clam beds, and sand dollars (*Echinarachnius parma*). Common benthic biota reported by the New York State Energy Research and Development Authority (NYSERDA) (2017) included sand dollars, brachyuran crabs, gastropods, bivalves, burrowing anemones, and sea stars. In softer fine and very fine sand, infaunal tube-building and burrowing polychaetes, as well as abundant beds of thin *Ampelisca* amphipod tubes, were observed as well as orange sponges. Demersal fishes of the region associate with benthic habitats on a variety of spatial scales. Sand ridges provide a distinct habitat for adults, settled juveniles, and larvae for various fish species (Auster et al. 1997; Steves et al. 1999; Vasslides and Able 2008). Burrowing species such as the north stargazer (*Astroscopus guttas*), and snakefish (*Trachinocephalus myops*) may be particularly susceptible to physical modification and/or loss of habitat (Able and Fahey 1998, Sulak 1990). At large scales (i.e., on the order of kilometers), ridges and swales provide relief and habitat complexity, but, for juvenile fishes, structure at smaller scales (i.e., meters to centimeter) is more important (Diaz et al. 2003). Small scale structures used by juvenile fishes as refuge from predation can be either physical (sand waves or bedforms) or biogenic (shell fragments, worm tubes, hydrozoans, and pits) in nature

(Auster et al. 1997). Structure-forming biota present on the seafloor such as worm (*Diopatra*) or amphipod (*Ampelisca*) tubes, orange sponges, or mussel beds also provide habitat for juvenile and newly settled fish species (Diaz et al. 2003). Additionally, inshore habitats can provide nursery habitats for various fish and invertebrate species with either demersal or pelagic eggs. Demersal eggs may be especially susceptible to disturbances, as they are heavier than seawater, and remain on the seafloor until the larval stage (Dahlberg 1979). However, studies suggest that predation may play more of factor in demersal egg survival than environmental disturbances (Dragesund and Nakken 1973). Tables E-5 to E-7 provide descriptions of life stages of select invertebrate (E-5), shark and skate (E-6), and bony fish (E-7) species with EFH identified in the project area (MAFCM 2014, NMFS 2017). Bottom habitats in inshore waters potentially traversed by transmission cables may be composed of detritus—clay-silt and sand-silt-clay sediments—which in some areas may include contaminants (Raposa and Schwartz 2009). Inshore soft bottom habitats also support SAV, shellfish beds, salt marshes, and other features that constitute important nursery areas for many federally managed species (Able and Fahy 2010). For example, the summer flounder juvenile HAPC exists primarily in inshore waters of the region. Important prey species such as Atlantic silversides, anchovies, and killifishes also inhabit inshore habitats. Benthic sampling could also include nearshore and estuarine complex habitats as well as SAV habitats along the proposed transmission cable routes.

Effects on Managed and Associated Species

Demersal species inhabiting soft bottom benthic habitat in the project area include adult and juvenile Atlantic sea scallops, Atlantic surfclams, ocean quahogs, Atlantic lobster, Jonah crab, clearnose skate (*Raja eglanteria*), little skate (*Leucoraja erinacea*), black seabass, monkfish, summer flounder, and windowpane flounder (*Scophthalmus aquosus*). The demersal fishes feed on benthic crustaceans, polychaete worms, mollusks, and various fishes. These and other demersal species may be directly affected by the activities expected for the Proposed Action that would disturb soft bottom habitats. Burrowing species may be affected by habitat modification and/or loss of habitat. Benthic crustaceans, and worms may experience mortality or displacement, thus, impacting their population. Demersal fishes that rely on these species may be indirectly impacted by the removal of prey species. Additionally, as described above, species that have a demersal egg phase are potentially impacted by disturbance to bottom habitat. A complete list of species with identified EFH in the project area is available in Tables E-5 to E-7.

Effects on Soft Bottom Habitat

This analysis covers the biological, geophysical, and geotechnical surveys associated with the Proposed Action that are expected to disrupt soft bottom seafloor habitats. The placement of met buoys is also considered.

Biological Sampling

Biological sampling methods expected to disrupt the seafloor include benthic grabs (e.g., Van Veen) and bottom trawls (e.g., otter and beam trawls, ventless traps). Benthic grab samplers used for assessing infauna assemblages remove on average about 0.1 m^2 of the upper 10 to 15 centimeters (cm) of seafloor sediment. The total area of seabed disturbed by individual sampling events (e.g., collection of a core or grab sample) is estimated to range from 1 to 10 m^2 for each lease area. A similar level of disturbance is to be expected from sampling within inshore transmission cable routes. These small volume samples may temporarily displace bottom feeding fishes and may remove or injure individual Atlantic sea scallops, Atlantic surfclams, or quahogs. These samples may also remove or injure demersal eggs or the egg cases deposited by various skate species. Infauna and epifauna that contribute to the prey base for demersal species such as hakes and skates may be affected by bottom sampling through habitat disturbance and/or removal. While the biological sampling will result in some benthic disturbance and direct mortality of soft bottom assemblages, the dispersed nature and limited number of these surveys will impact only a small area of available soft bottom habitat in the region and the surveys are not expected to have long-term adverse effects on EFH of managed species. Potential effects are anticipated to be short-term and localized to the area of impact.

Bottom trawl sampling expected for the proposed Central Atlantic WEA leasing is expected to follow the guidelines described by BOEM (2019b). Geotechnical/benthic sampling of the WEAs would require a sample at every potential wind turbine location (which would only occur in the portion of the WEA where structural placement is allowed) and one sample per kilometer of offshore export cable corridor. The amount of effort and vessel trips required to collect the geotechnical samples varies greatly by the type of technology used to retrieve the sample (**Table 2-6** of the EA). The area of seabed disturbed by individual sampling events (e.g., collection of a core or grab sample) is estimated to range from 1 to 10 m^2 (BOEM 2014a; Fugro Marine GeoServices Inc. 2017). Some vessels require anchoring for brief periods using small anchors; however, approximately 50% of deployments for this sampling work could involve a boat having dynamic positioning capability (i.e., no seafloor anchoring impacts) (BOEM 2014a).

Recovery of bottom grabs, otter trawls, beam trawls, or ventless traps lost during a survey may entail dragging grapnel lines, which could also disturb demersal habitats. Such recovery efforts are expected to occur infrequently and are not expected to have adverse effects on EFH of managed species or life stages.

Seafloor disturbance, as described above, may result from biological sampling in inshore waters (transmission cable routes) and may also affect EFH for managed species, especially egg and juvenile stages. Potentially vulnerable HAPCs (**Figure E-2**) are also present in inshore waters. These include summer flounder SAV (all areas), sand tiger shark (Delaware Bay) and sandbar shark (Delaware Bay and Chesapeake Bay) nursery areas, and tilefish nursery area (Norfolk Canyon).

HRG Surveys

HRG survey data provides information on seafloor and sub-surface conditions as they pertain to the project siting and design. This includes shallow geologic and anthropogenic hazards, like the presence or absence of archaeological resources. HRG data acquisition instrumentation used during surveys could add noise to the underwater environment (**Table E-2**). These surveys may affect sand tiger, sandbar shark, and tilefish HAPCs illustrated in **Figure E-2**. Effects of HRG surveys on soft bottom species, EFH, or HAPCs are not expected to be significant and are considered in more detail under **Section E.4.3, Pelagic Habitat**.

Geotechnical Surveys

Geotechnical surveys may involve vibracores, piston cores, deep borings, cone penetrometers, sediment profile imagers, and other forms of bottom-sampling gear (**Table E-3**). These methods would disturb soft bottom seafloor habitats by creating holes and pits. Epifauna and infauna resources important to bottom feeding fishes may be lost under and around areas where gear contacts the bottom. Average bottom coverage expected for vibracore, piston core, and deep boring samples is 1 m^2. These sampling methods would generate noise up to 150 decibels (dB) for deep borings (see **Table E-3**). This level is below the threshold considered detrimental to fish physiology and behavior (Popper et al. 2014). For most of these methods, survey vessels require anchoring for brief periods using small anchors; however, approximately 50% of deployments for this sampling work could involve a boat having dynamic positioning capability (i.e., no seafloor anchoring impacts) (BOEM 2014).

Meteorological Buoy Deployment

Met buoys are towed or carried aboard a vessel to the installation location and either lowered to the surface from the deck of the vessel or placed over the final location where the mooring anchor is dropped (BOEM 2014). Based on previous proposals, anchors for boat-shaped or discus-shaped buoys would each weigh about 2,721 to 4,536 kilograms (kg) and have a footprint of about 0.5 m^2 and an anchor sweep of about 34,398 m^2. The maximum number of buoys expected for the project is eight, resulting in a potential impact on soft bottom habitat from anchors of 4 m^2; impacts from anchor chain sweep would be 68 acres. The types of impacts likely to occur are similar to the ones previously described for seafloor disturbance from benthic sampling.

Summary

Soft bottom habitats disturbed by these activities (with the exception of the buoy anchors) are expected to recover physically and biologically over time. Physical recovery by infilling of sediment would proceed rapidly in areas with higher waves and stronger currents and less rapidly in low energy environments. Because the sedimentary regime is generally uniform, recolonization of surficial sediments likely would proceed rapidly through larval settlement and immigration of motile individuals from adjacent undisturbed areas (Newell et al. 1998). Because these actions affect small portions of the survey areas, an adequate supply of motile taxa would be available for rapid migration into impacted areas. Although community composition may differ for a period of time after the disturbance, the infaunal assemblage type that exists in affected areas is expected to be broadly similar, taxonomically and functionally, to naturally occurring assemblages in the study area over time. Based on previous observations of infaunal re-establishment in areas damaged by dredges, the infauna assemblage most likely would become reestablished within approximately 2 years, exhibiting levels of infauna abundance, diversity, and composition comparable to nearby non-impacted areas (Brooks et al. 2006).

Injury to relatively immobile Atlantic scallops, ocean quahogs, and surfclams would be limited due to the patchy nature of their distributions across the shelf (Stokesbury and Himmelman 1993). Bottom feeding fishes may be temporarily displaced from feeding areas. Other demersal species would actively avoid bottom-disturbing sampling activities.

Inshore EFH may be directly affected by site characterization activity. Much of the inshore habitat such as SAV, salt marshes, and soft bottom is important for supporting early life stages of bluefish, weakfish, striped bass, scup, black seabass, and summer flounder. HAPCs for summer flounder, sand tiger shark, sandbar shark, and tilefish cover much of the inshore waters of the project area. Surveying of inshore soft bottom habitats may potentially affect EFH or HAPCs, but due to wide spatial coverage (kilometers) and limited temporal exposure (days to weeks), adverse effects are not expected.

Therefore, the effects from bottom sampling, geophysical and geotechnical sampling, and met buoy deployment are not expected to significantly adversely affect the EFH of federally managed species or associated prey and HAPCs.

E.4.2 Hardbottom Benthic Habitat

Fish species such as black seabass (*Centropristis striatus*), scup (*Stenotomus chrysops*), cunner (*Tautogolabrus adspersus*), tautog (*Tautoga onitis*), sheepshead (*Archosargus probatocephalus*), Atlantic striped bass, Atlantic cod, and conger eel (*Conger oceanicus*) associate with artificial or natural hardbottom habitats. A Hardbottom habitat is defined by the Coastal and Marine Ecological Classification System (CMECS) as habitat that includes Substrate Class Rock Substrate, and Gravels, Gravel Mixes, Gravelly, and Shell substrate classes (NMFS 2021b). Natural and artificial hardbottom habitats occur in inshore waters of the region and include rocky outcrops, oyster reefs, and blue mussel beds. Artificial hardbottom consists of construction-derived structures (breakwaters, pilings, piers, riprap shorelines, etc.) as well as planned artificial reefs (Steimle and Zeitlin 2000). Artificial reefs are human-made underwater structures that are developed intentionally or from remnants of objects built for other purposes, such as shipwrecks (Steimle and Zeitlin 2000). According to the Marine Cadastre Ocean Reports data portal most of the artificial reefs in this region are close to shore and outside of the lease areas (BOEM and NOAA 2024).

Data collected during initial remote geophysical surveys would identify possible locations for hardbottom habitat communities. Met buoys would only be installed in the proposed lease areas, and BOEM would require the lessee to develop and implement avoidance measures near these resources before authorizing activities that would disturb hardbottom habitats.

Effects on Managed and Associated Species

Managed species such as black seabass may be attracted to moored buoys and their anchors due to the shelter and feeding potential associated with hard structures (Fabrizio et al. 2013). Although pelagic species, squids attach demersal egg clusters (“mops”) to hard substrata such as shells, lobster pots, piers, fishing traps, boulders, and rocks (Jacobson 2005). Moored buoys and anchors may provide a similar ecological function. In this case, the effect on managed species has the potential to be positive, as the buoys provides additional habitat. However, with a maximum of eight met buoys expected for the entire project, such an artificial reef effect is expected to be negligible. In inshore and offshore hardbottom habitats, the Atlantic sea scallop uses any hard surface for pelagic larvae to settle (Table E-5). This habitat has the potential to be disturbed during geophysical surveys.

Effects on Hardbottom Habitat

No significant effects on benthic hardbottom habitats are expected due to the relatively low occurrence of these habitats in each WEA. Hardbottom habitats may exist in small, isolated patches along the transmission cable routes to shore, but data collected during initial geophysical surveys could identify alternate locations to allow for avoidance of these habitats. Therefore, no impacts on hardbottom habitat or on managed or associated EFH species is expected.

Summary

Due to the scarcity of hardbottom habitat in the WEAs and surrounding area, and the avoidance measures that would be implemented, hardbottom habitats are unlikely to be affected by activities conducted under the Proposed Action. Therefore, the effects from bottom sampling, geophysical and geotechnical sampling, and met buoy deployment are not expected to adversely affect the EFH of federally managed species, associated prey, or HAPCs. An artificial reef effect may occur for species that are affiliated with hardbottom habitats, such as black seabass and pelagic squids, but that effect is expected to be beneficial and negligible.

E.4.3 Pelagic Habitat

The offshore pelagic environment of the project area experiences large seasonal temperature changes at the surface and bottom. In winter months (October to April) water temperatures drop to just above 1°C. During this time, the water column is not thermally stratified. As waters warm (15 to 20°C) in mid to late April, the water column stratifies (Guida et al. 2017). Large scale circulation in the Mid-Atlantic Bight (and the NY Bight) involves a mass of cold bottom water (the cold pool) that moves from Georges Bank southward into the project area in the warm season. The cold pool holds nutrients over the shelf during the spring and summer, which in turn promotes phytoplankton productivity and affects fish distributions and behavior (Lentz 2017; Nye et al. 2009). None of the activities described for the Proposed Action are expected to have any effect on the water column environment. Currents over the shelf tend to follow major isobaths and generally increase with increasing water depth (Guida et al. 2017).

Effects on Managed and Associated Species

The primary pelagic invertebrates with EFH in the WEA are longfin inshore squid and northern shortfin squids. Common pelagic fishes inhabiting the project area include Atlantic mackerel, bluefish, butterfish, yellowfin tuna, albacore tuna, skipjack tuna, weakfish, and striped bass. Sharks found in the water column include sandbar shark, dusky shark, blue shark, and spiny dogfish. Other pelagic species such as alewife (*Alosa psuedoharengus*), American shad (*Alosa sapidissima*), Atlantic herring, and Atlantic menhaden (*Brevoortia tyrannus*) also occur in the area. In addition, several demersal species have pelagic larvae whose EFH overlaps the WEAs (**Table E-7**). These species move mostly in response to seasonal water temperature changes. Movements may be across the shelf or north and south, depending on the species.

The potential impacts of renewable energy site characterization on pelagic resources and EFH have been analyzed in the previous Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic OCS Offshore New Jersey, Delaware, Maryland, and Virgnia EA (BOEM 2012), which is incorporated herein by reference. Key impact-producing factors for the pelagic environment are sediment suspension (elevated turbidity) and noise generated by biological, geological, and geotechnical surveying. Elevated turbidity can cause avoidance and attraction movements, impair feeding, and lead to physiological changes in adult pelagic fishes. Gill cavities can be clogged by suspended sediment, which can mechanically affect food gathering in planktivorous species. High levels of suspended sediment can clog gill cavities and erode gill lamellae (Wenger et al. 2017), preventing or interfering with normal gill respiration. Motile species such as squids, summer flounder, striped bass, Atlantic herring, Atlantic mackerel, bluefish, and butterfish could avoid turbid areas and escape most of those impacts. In contrast, less motile organisms—including pelagic larvae of sea scallops, ocean quahogs, Atlantic surfclams, and many species of fishes—would temporarily experience impaired sensory abilities.

Medium and shallow seabed profilers are the only HRG sound sources expected to produce sounds within finfish and invertebrate hearing ranges. Sound exposure levels are expected to be below the hearing damage thresholds for fishes and invertebrates (Popper and Hawkins 2018). Fishes can also detect particle motion at frequencies produced during HRG surveys, but understanding of the potential effects of particle motion on fish and invertebrates is limited and suggests that impacts are similar to pressure waves unless animals are close to the sound source (Popper and Hawkins 2018; Weilgart 2018). Acoustic impacts would result in temporary and spatially limited changes in behavior and displacement, particularly to those species capable of hearing in the high-frequency range, such as herrings, although these species are expected to avoid such sounds. Ichthyoplankton (eggs and larvae) and other organisms inhabiting the water column or near the water surface are unlikely to be affected by noise unless they are within a few meters of the activities (Popper et al. 2014). Therefore, only a small percentage of the ichthyoplankton and overall plankton assemblage populations would be affected.

Effects on Pelagic Habitat

Biological Sampling

Installation of clump anchors associated with met buoys, vibracoring, bottom sampling (trawling or bottom grabs), or deep borings may cause an increase in local suspended sediments. These impacts would be limited to the immediate area surrounding the anchors and of short duration. Suspended sediments could elevate ambient turbidity of the water column, which would be a localized, transient effect.

In general, biotic assemblages of the Mid-Atlantic Bight inner shelf are regularly subjected to periodic reworking of surficial sediments caused by storm events and are unlikely to experience adverse effects that are greater than those due to the normal dynamic environment. Effects from proposed activities would be limited to within hundreds of meters of anchoring and other bottom-disturbing activities and would persist for a matter of hours after the activity ceases. The sweep of anchor chains across the sedimentary seafloor is expected to elevate turbidity in small areas adjacent to the met buoys. Anchor sweep is expected to be a limited but continuous process. Biological, geological, and geotechnical sampling would temporarily elevate turbidity, but there would be no lasting adverse effect on the water column habitat from this disruption.

HRG Surveys

HRG surveys acquire geophysical shallow hazards information, and their primary impact is likely to be increasing noise. Noise characteristics of equipment used during HRG surveys are provided in **Table E-2**. Increased vessel presence and traffic during HRG surveys could result in several impact-producing factors, including noise, routine vessel discharges, and lighting from vessels. Survey of inshore transmission cable routes could interact with HAPCs for summer flounder (SAV), sand tiger shark, sandbar shark, and tilefish (**Figure E-2**). None of these factors are expected to adversely affect managed species, EFH, or HAPCs as they would be short in duration (weeks) and conducted from moving vessels.

Impacts from acoustic sound sources from HRG survey methods such as side-scan sonar, multibeam sonar, and seabed profilers are not expected. Medium and shallow seabed profilers (such as a boomer plate) are the only sound source expected to produce sounds within finfish and invertebrate hearing ranges. Fish are not expected to be exposed to sound pressure levels that could cause hearing damage (Popper et al. 2014). While fishes can also detect particle motion at frequencies produced during HRG surveys, there is currently limited understanding of the potential effects of particle motion on fish and invertebrates (Popper and Hawkins 2018). In general, particle motion is most relevant to frequencies below 1,000 hertz (Hz) and within close ranges to the source (within tens of meters), although some information suggests that fish and invertebrates may perceive this at greater distances. At longer ranges from the source, it is expected that particle motion associated with impulsive noise sources (e.g., medium seabed profilers) will have similar effects to pressure waves in fish and invertebrate species (Weilgart 2018). Additionally, because there are no accepted thresholds for particle motion from which the potential for impact may be assessed, particle motion impacts were not evaluated separately from sound pressure impacts. Sound exposure levels would also be below harmful thresholds for fishes and invertebrates. Impacts would result in temporary and spatially limited changes in behavior and displacement, particularly to those species capable of hearing in the high-frequency range, such as herrings. Impulsive seismic sounds may affect squid behavior and physiology by damaging statoliths used for balance (André et al. 2011). Such effects may prevent squids from detecting predators, locating food, or finding mates. Other prey species sensitive to sounds (e.g., shads, menhaden, Atlantic herring, anchovies) may temporarily move from a project area during acoustic surveys, affecting some predators. General effects of acoustic survey devices on EFH for managed species in the area are also detailed in BOEM 2014.

Placement of moored metocean buoys is expected to only affect currents around the mooring lines of the structure, creating minor turbulence at that point. Based on the limited extent of water column effects, no adverse effects on pelagic biota or habitat associated with persistent remnant wintertime bottom water (cold pool; an important feature of the water column in the Mid-Atlantic Bight) are expected. The hydrodynamic environment of the project area likely would not be adversely affected by the small water column footprint of met buoys.

Summary

Pelagic habitats disturbed by site characterization activities are expected to recover from elevated turbidity and altered noise regimes in a short time (hours to days). Suspended sediments would dissipate within hours of suspension. Much of the sediment in offshore areas is sandy and is expected to settle out rapidly. Fishes and squids can actively avoid clouds of elevated turbidity created by bottom-sampling gear. Passively drifting larvae of managed species and their prey may experience reduced sensory capabilities and other physiological effects while entrained in suspended sediment plumes. Due to the patchy distribution of larvae at small scales and the small volumes of suspended sediment expected, effects on larval stages should be negligible. Because of relatively finer grained sediments found in nearshore waters, the extent and duration of equipment-caused turbidity is expected to be higher for surveys of transmission cable routes than for the WEAs. However, because of relatively small footprints expected for these corridors, adverse effects on EFH of managed species life stages or prey are not expected.

Noise from HRG surveys is expected to be below the levels considered detrimental to fish physiology and behavior (Popper et al. 2014). Most of the managed fish species—such as sharks, skates, tunas, Atlantic mackerel, and bluefish—found in shelf waters or species occurring within nearshore transmission corridors would not be adversely affected by the expected sound levels produced by HRG surveys.

Elevated turbidity and noise generated by bottom sampling, geophysical and geotechnical sampling, and met buoy deployment are not expected to noticeably adversely affect the EFH, associated prey, or HAPCs of federally managed pelagic species or their life stages. The same conclusion would apply to other NOAA Trust Resources, including weakfish, striped bass, Atlantic menhaden, and river herrings.

E.5 Standard Operating Conditions

Standard Operating Conditions for the Proposed Action are described in **Section 4** of the EA. BOEM's primary mitigation strategy has and will continue to be avoidance. For example, the exact location of met buoys would be adjusted to avoid adverse effects on biologically sensitive habitats, if present. Overall impacts on finfish and invertebrates from biological surveys are anticipated to be **negligible**, but BOEM recognizes that some fishery surveys could impact ESA-listed species. Thus, BOEM is proposing to prohibit fisheries surveys until all required ESA consultations are concluded.

E.6 Conclusions

Based on the analysis in the preceding sections, the Proposed Action is not expected to have lasting adverse effects on EFH, federally managed species, associated prey, or HAPCs at or around the WEAs. Impacts on the water column habitat would be localized and transient, with no significant adverse effect on EFH for any pelagic species. Minor disturbance of soft bottom areas may occur, but no significant adverse effects on soft bottom benthic habitats are expected due to the small area of seafloor disturbance relative to the available habitat, and any disturbed habitat would be expected to recover in short time frames. Hardbottom habitats would be avoided during met buoy placement; thus, no adverse effects are anticipated.

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Appendix G: Public Comments and BOEM's Responses

G.1 Overview

To initiate the public review and comment period of the intent to prepare an Environmental Assessment (EA), the Bureau of Ocean Energy Management (BOEM) took the following actions:

1. On August 1, 2023, BOEM issued a notice of intent (NOI) to prepare an Environmental Assessment (EA) to consider the potential environmental impacts associated with possible wind energy-related leasing, site assessment, and site characterization activities on the U.S. Atlantic Outer Continental Shelf (OCS) offshore Delaware, Maryland, and Virginia, and granting of rights-of-way and rights-of-use and easement in the region. The NOI initiated a 30-day public comment period, which closed on August 31, 2023.

All comments received during the comment period for the NOI were impartially assessed and considered by BOEM during preparation of this Draft EA. Comments were received from state political members, Federal and state agencies, environmental and nongovernmental organizations (NGOs), business/labor interests including the renewable and non-renewable energy sectors, and individuals. **Table G-1** provides a list of the stakeholders who submitted substantive comments along with their affiliation and type of organization. All comment letters are available for viewing at www.regulations.gov under docket number BOEM-2023-0034. Some comment letters received were submitted with attachments; attachments submitted with comment letters are included in the EA administrative record but are not covered herein if not directly relevant to the proposed Central Atlantic Wind Auction.

Table G-1. List of commenters who provided substantive comments

Commenter Name	Type of Organization	Organization/Affiliation
Anonymous*	Individual	N/A
No name provided	Business/Labor Interest	Baltimore Port Maritime Council, AFL-CIO (BPMC)
No name provided	NGO	Business Network for Offshore Wind and Strum Contracting
No name provided	Federal Agency	U.S. Army Corps of Engineers (USACE)
Bettina Rayfield	State Agency	Commonwealth of Virginia Office of Environmental Impact Review
No name provided	Business/Labor Interest	Corio Generation
No name provided	Business/Labor Interest	Crystal Steel Fabricators
Davon Morris	Individual	N/A
No name provided	State Agency	Delaware Department of Natural Resources and Environmental Control (DNREC)
Elizabeth Reineck	Individual	N/A
No name provided	Federal Agency	U.S. Environmental Protection Agency (USEPA)

Commenter Name	Type of Organization	Organization/Affiliation
No name provided	Business/Labor Interest	Equinor Wind US
No name provided	Business/Labor Interest	International Brotherhood of Electrical Workers, AFL-CIO, CLC (IBEW)
No name provided	Business/Labor Interest	International Brotherhood of Electrical Workers, Local 24
No name provided	Business/Labor Interest	Ironworkers Mid-Atlantic States District Council
Julien Antkies	Individual	N/A
Katie Fry Hester	Elected Official	Maryland State Senate
Lindsay Meeks	Individual	N/A
Mark Hodges	Individual	N/A
Mary Beth Carozza	Elected Official	Maryland State Senate
MaryBeth Feeney	Individual	N/A
No name provided	State Agency	Maryland Energy Administration and Maryland Department of Natural Resources (DNR)
No name provided	Federal Agency Representative	Mid-Atlantic Fishery Management Council MAFMC) and New England Fishery Management Council (NEFMC)
No name provided	Business/Labor Interest	Mighty Waves Energy
No name provided	NGO	National Wildlife Federation, Southern Environmental Law Center, Natural Resources Defense Council, et al.
No name provided	NGO	North American Submarine Cable Association
Roy Cooper and Wes Moore	Elected Official	North Carolina Governor and Maryland Governor
No name provided	Business/Labor Interest	Ocean Winds North America LLC
No name provided	NGO	POWER, People for Offshore Wind Energy Resources
No name provided	NGO	Protect our Coast Delmarva
No name provided	NGO	Responsible Offshore Development Alliance
Richard Kubiak	Individual	N/A
No name provided	NGO	Sierra Club*
No name provided	NGO	Southeastern Wind Coalition, American Clean Power Association, MAREC Action
No name provided	Business/Labor Interest	Surfside Foods, LLC
No name provided	NGO	The American Waterways Operators
Lorig Charkoudian	Elected Official	The Maryland House of Delegates
No name provided	Local and Regional Agencies	Town of Ocean City Maryland

Commenter Name	Type of Organization	Organization/Affiliation
Terence McGean, P.E.	Local and Regional Agencies	Town of Ocean City, Maryland
No name provided	NGO	Turn Forward
Arlene Warren	State Agency Representative	Virginia Department of Health – Office of Drinking Water
No name provided	NGO	West Coast Pelagic Conservation Group
WhoPoo App	Individual	N/A

* = commenter made more than one submission; AFL-CIO = American Federation of Labor and Congress of Industrial Organizations; N/A = not applicable; NGO = Nongovernmental Organization.

G.1.1 Comment Review and Response Protocol

All comments were reviewed and systematically categorized in the same manner, and each individual comment document (submission) was entered into a comment database as a unique submission. A total of 104 unique comment submissions were received during the public comment period; no form letters were submitted. Each unique comment submission was reviewed to determine if it contained general and similar concerns or if it contained substantive comments requiring detailed technical responses and/or changes to the Draft EA. Forty-four (44) unique comment letters were classified as substantive and were divided into categories based on the contents of the Draft EA. BOEM modified the Draft EA, as necessary, and provided responses to public comments below.

G.2 SUMMARY OF COMMENTS

The following section provides an overview and summary of the comments presented in the comment letters and is not intended to be a reproduction of the exact wording of individual comments (unless otherwise noted). The summaries illustrate the varied issues, concerns, or requested changes to the EA. For some resources, the summary information is more detailed, as these resources received more detailed comments from submitters.

G.2.1 Proposed Action

Comment Summary

BOEM received comments in support of, and in opposition to, the development of offshore wind in the Central Atlantic and in the United States as a whole. Supporting comments cited benefits to local employment and reduction in climate change impacts as their primary reasons. Opposing comments cited visibility concerns, and potential adverse impacts on commercial fisheries and for-hire recreational fishing, benthic resources, and marine mammals as their primary reasons. The Town of Ocean City, Maryland, offered support for Wind Energy Areas (WEAs) A-2 and C-1, provided BOEM restricts the turbine sizes in these areas so that the top of the nacelle is beyond the visible horizon from any residential dwelling.

The U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency (USEPA) noted that the EA should include as much detail as possible to address potential impacts of the Proposed Action, including surveys and testing, on environmental resources and Federal projects.

One commenter noted that the Proposed Action is sited in a high-traffic area and expressed navigational safety concerns as well as concerns regarding the installation of transmission cables. This commenter asked who would be conducting maintenance and decommissioning activities for the offshore wind farms.

BOEM Response to Comments

Comments in support of, and opposition to, the development of offshore wind and/or offshore wind within the Central Atlantic region are noted.

BOEM's renewable energy program occurs in four distinct phases: planning, leasing, site assessment, and construction and operations. The identification of WEAs for environmental analysis and leasing consideration does not constitute a final leasing decision. As discussed in **Section 2**, of the EA, this analysis does not consider whether a site is suitable for commercial development, as a future lessee would make that determination before submitting a Construction and Operations Plan (COP) for BOEM's review. An environmental analysis of the project-specific design parameters and potential mitigation measures, such as turbine height restrictions and burial depth of transmission cables, would be conducted at that time. If approved, maintenance and decommissioning activities would be the responsibility of the lessee.

BOEM's EA incorporates the best available science and as much detail as is feasible.

G.2.2 Alternatives

Comment Summary

Commenters stated that the WEAs, as proposed, do not provide sufficient acreage to help meet the states' or the nation's energy goals and do not maximize the areas viable for leasing. Some also noted that the small size of the WEAs would not help ensure a robust and durable offshore wind supply chain in the region. Additionally, commenters mentioned that the Proposed Action falls short of reaching state-level wind energy goals, especially when the energy produced by the Proposed Action will be shared across multiple states. These commenters recommended that BOEM expand the areas analyzed in the EA, some suggesting an EA evaluating the entire offshore Central Atlantic region in proximity to Delaware, Maryland, Virginia, and perhaps North Carolina.

Several commenters proposed that BOEM develop a programmatic environmental impact statement, analyzing potential offshore wind activities in the Central Atlantic region.

Commenters, including USEPA, the Delaware Department of Natural Resources and Environmental Control (DNREC), Mid-Atlantic Fishery Management Council (MAFMC) and New England Fishery Management Council (NEFMC), provided recommendations for BOEM on how to identify and assess the alternatives and establish lease stipulations. Further, USEPA requested that BOEM clarify the availability and accessibility of onshore infrastructure to the WEAs.

BOEM Response to Comments

This EA complies with the procedural and substantive requirements of the National Environmental Policy Act (NEPA). On November 16, 2022, BOEM published on regulations.gov (docket number BOEM-

2022-0072) the Notice for Comment for eight Draft WEAs on the Central Atlantic OCS. Four engagement meetings were held during the 30-day public comment period. The WEAs included as part of the Proposed Action of this EA were developed following consideration of the comments received during that public comment period, in partnership with the National Oceanic and Atmospheric Administration's (NOAA's) National Centers for Coastal Ocean Science (NCCOS), and in coordination with the Department of Defense (DoD) and U.S. Coast Guard (USCG). (Please see Memorandum for Area Identification in the Central Atlantic, https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/Central%20Atlantic%20Memorandum%20for%20Area%20ID.pdf, for further detail.) As explained during an October 10, 2023, Central Atlantic Intergovernmental Renewable Energy Task Force meeting (https://www.boem.gov/renewable-energy/state-activities/central-atlantic), areas within the Draft Call Area were removed from analysis due to several concerns including: navigation, fisheries siting, sea turtle siting, and the National Aeronautics and Space Administration (NASA) Exclusion Zone. As a result, an analysis of expanded WEAs or the larger Central Atlantic region is not feasible.

BOEM will take into consideration the commenters recommendations for lease stipulations and terms and conditions at the appropriate future time.

G.2.3 Purpose and Need for Action

Comment Summary

USACE and USEPA requested to participate as Cooperating Agencies for the development of the EA and noted their statutory authority under Sections 10 and 14 of the Rivers and Harbors Act of 1899, and Section 404 of the Clean Water Act; and Section 309 of the Clean Air Act, and Sections 402(d) and 404(b), (c), and (q) of the Clean Water Act, respectively. USACE and USEPA noted that the EA should include as much detail as possible to address potential impacts on environmental resources and Federal projects.

USEPA recommended early coordination with agencies with regards to known unexploded ordnance (UXO) in the WEAs' vicinity and with regards to the Dam Neck Ocean Dredged Material Disposal Site.

The MAFMC and NEFMC requested access to data viewers that show information such as backscatter, bedforms, and boulder fields, as well as numbered turbine positions, so they may be more effective partners with NOAA Fisheries on Essential Fish Habitat (EFH) consultations for future projects. This level of data sharing could be considered during development of the proposed sale notice for the Central Atlantic WEAs.

One commenter asked as to why there is a need for an offshore wind farm off the coast of Maryland and how it would benefit electrical power consumers.

BOEM Response to Comments

BOEM acknowledges USACE's and USEPA's requests to serve as Cooperating Agencies in the preparation of this EA and recognizes their statutory authority. UXO identification within the WEAs would not occur until after lease issuance; coordination with specific disposal sites would also not occur until after lease issuance.

BOEM expects the development of offshore wind farms will lead to reductions in fossil fuel usage in the United States. The extent of avoided emissions and potential financial benefits to consumers would be analyzed on a proposed project–specific basis. Maryland state law requires the state to reduce greenhouse gas emissions by 60 percent from 2006 levels by 2031, and Maryland's Renewable Energy Portfolio Standard (RPS) requires 50 percent of all electricity sales within the state to be sourced by renewable energy by 2030. Furthermore, Maryland has an offshore wind capacity goal of 8.5 gigawatt (GW) by 2031. As a result, offshore wind off Maryland's coast is being considered.

This EA analyzes potential site assessment activities within the WEAs; positions of turbines and data specific to turbine positions within the WEAs would only be developed in the event that a lessee submits a COP for proposed development in any of the WEAs. A national data viewer that has data related to oceanography and benthic resources and constructed and proposed offshore infrastructure is available at https://marinecadastre.gov/nationalviewer/.

G.2.4 NEPA/Public Involvement Process

Comment Summary

The Town of Ocean City, Maryland, has requested to become a Cooperating Agency.

Several commenters recommended that BOEM require consistency, coordination, communication, and outreach between the public, stakeholder groups, and lessees regarding surveys, such as site assessment and site characterization surveys, and that the public have an opportunity to comment on such. Another commenter similarly stated that decisions are made at the local, state, and business levels prior to environmental review, and requested that BOEM develop a comprehensive planning process that removes segmentation that marginalizes fisheries.

One commenter stated they appreciated that BOEM associated a public comment period with the EA NOI, and will with the Draft EA, as it is not required by NEPA.

USEPA recommended additional Tribal outreach efforts regarding the WEAs, and that all federally recognized Tribes are given ample time for participation in the process. USEPA also stated that it is important for formal government to government consultation take place early in the scoping phase of the Project.

A commenter stated that the public has not been properly informed of comment periods regarding BOEM's offshore wind energy projects, and that news stations do not report on availability of comment periods.

Multiple commenters stated that this project may be better suited for an Environmental Impact Statement (EIS) or a Programmatic EIS (PEIS), as this will allow for a more comprehensive cumulative impact analysis and will advise BOEM and other stakeholders as well as lessees as to what concerns may emerge once all stages of development are considered, in addition to an EIS or PEIS having a more robust analysis of potential impacts and alternatives.

USEPA recommends that BOEM use the smallest geography possible when conducting environmental justice analyses. USEPA also recommends addressing whether development of the WEAs and associated activities would cause any adverse impacts; use of the most recent data; performing community outreach; and identifying opportunities with mitigation.

BOEM Response to Comments

BOEM acknowledges the Town of Ocean City, Maryland's request to serve as a Cooperating Agency in the preparation of this EA. BOEM is required to establish a memorandum of understanding (MOU) with local governments requesting to serve as Cooperating Agencies, and that the MOU includes a schedule with critical action dates and milestones, mutual responsibilities, designated points of contact, and expectations for handling pre-decisional information. An MOU between the Town of Ocean City and BOEM was signed in November 2023.

BOEM has conducted several Ocean User and Stakeholder Meetings prior to the release of this NOI. Specific meetings have been held for the maritime industry, non-governmental organizations (NGOs), fisheries, developers, and fishermen. The purpose of these meetings is to meet with ocean users and key stakeholders to gather information to inform decisions regarding offshore wind activities; to discuss the leasing process, engagement activities, and area development; and to reduce industry segmentation. The public will have an opportunity to comment on this EA (an EA for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Delaware, Maryland, and Virginia) once the draft is published.

BOEM notes the appreciation of including comment periods with this EA.

There have been multiple Tribal and Renewable Energy Task Force Meetings, with the most recent meeting occurring in October 2023. Federally recognized Tribes are invited to each of the Task Force Meetings, as can be seen in the meeting summary documents.

The public was informed of this Project's comment period in at least one local news source: *The Dispatch* (Ocean City, Maryland), where it was stated that the public had until the end of August 2023 to submit comments.

This EA is being prepared to determine whether the issuance of leases within the WEAs would lead to reasonably foreseeable significant impacts on the environment, which would ultimately lead to an EIS or PEIS prior to any lease issuance. Cumulative impacts are considered, analyzed, and discussed within the EA, and would be thoroughly discussed and analyzed as part of an EIS or PEIS if an EIS or PEIS is found to be necessary prior to lease issuance.

BOEM identifies environmental justice communities using the smallest geography available, such as block groups from the U.S. Census Bureau. Environmental justice is a resource that was eliminated from further consideration in this EA as there are no anticipated impacts occurring on environmental justice communities, as described in **Appendix B,** *Resources Eliminated from Detailed Consideration and Assessment of Resources with Negligible Impacts*. Community engagement and outreach is a vital part of BOEM's decision-making process. BOEM is using regulatory tools and working with partners and stakeholders to avoid, minimize, and mitigate impacts and equitably distribute benefits. BOEM is also working to enhance engagement with environmental justice communities.

G.2.5 Planned Activities Scenario/Cumulative Impacts

Comment Summary

One commenter stated that all the current and upcoming lease sales will help create economies of scale and assurances that will benefit electricity consumers and make it easier to reach the Biden Administration's clean energy goals. They also stated that more sales will result in more power, which will magnify the effects of reliable, affordable clean energy on the East Coast.

A commenter stated that the sale of additional lease areas will add to the cumulative effects of existing offshore wind under development, and that these impacts should be carefully addressed. The commenter specifically stated that WEA C-1 has high probability of cumulative effects by being adjacent to the Coastal Virginia Offshore Wind (CVOW-C) Project. The commenter also recommended identifying how resources, ecosystems, and communities will be affected by cumulative activities.

Commenters requested that BOEM consider individual project and cumulative impacts as they relate to life stages of fish, habitats, and fisheries, and that if complete avoidance is not possible, impacts should be minimized and fully mitigated as much as possible. Additionally, commenters requested that BOEM take action to address ongoing impacts from unregulated offshore wind activities and to complete a PEIS evaluating cumulative impacts.

One commenter expressed concern about cable burial depth and the issues related to the Block Island Offshore Wind Project. The commenter urged BOEM to take steps to develop a comprehensive approach to the submarine cable installation coordination during the development of the WEAs.

One commenter expressed concern that offshore wind projects threaten Maryland's efforts to lessen the impact of underground utilities on the viewshed.

A commenter mentioned that the completion schedule and offshore wind output goal dates are likely to be extended for projects.

A commenter stated that to reach the Biden Administration's goals, BOEM should work to support further development of shallow water offshore wind in the central Atlantic.

One comment suggests that BOEM conduct an EIS to provide a more complete analysis of potential impacts and to include the analysis and potential impacts into the Proposed and Final Sales Notices to address potential impacts up front, as approval of leases will lead to effects that are reasonably foreseeable.

BOEM Response to Comments

Cumulative impacts are referred to as planned actions in this EA, and several types of planned actions are considered in analysis. Planned actions considered in analysis are (1) other wind energy development activities such as site characterization surveys; site assessment activities; and construction, operation, and decommissioning of wind energy facilities that could occur on existing leases; (2) hydrokinetic projects; (3) undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); (4) marine minerals use and ocean dredged material disposal; (5) military use; (6) marine transportation; (7) fisheries use and management; and (8) global climate change. Planned actions are described in **Appendix D** of the EA.

Impacts of planned actions are carefully considered, analyzed, and addressed throughout the EA, and for each resource identified as being potentially affected. BOEM considered in this EA individual project and cumulative impacts as they relate to life stages of fish, habitats, and fisheries. The EA addresses how resources, ecosystems, and communities could be affected by cumulative impacts of planned activities, including the proposed CVOW-C Project and other planned offshore wind projects under BOEM's regulatory purview.

This EA addresses offshore wind energy in the specifically identified WEAs in the Central Atlantic. Other potential Central Atlantic WEAs were not included in the EA for various reasons described in EA **Section 2**. BOEM would prepare EAs for other offshore wind energy WEAs that may be identified in the future.

This EA is being prepared to determine whether the issuance of leases within the WEAs would lead to reasonably foreseeable significant impacts on the environment, which would ultimately lead to an EIS or PEIS prior to any lease issuance. Cumulative impacts are considered, analyzed, and discussed within the EA, and would be thoroughly discussed and analyzed as part of an EIS or PEIS if either is found to be necessary prior to lease issuance.

BOEM acknowledges that schedules of activities for projects identified in the EA may be extended.

Potential impacts of offshore wind development would be assessed if a lessee submits a COP and would include assessment of potential impacts on onshore underground utility work conducted by states on the eastern seaboard.

G.2.6 Analysis Scope, Methods, and Assumptions

Comment Summary

One commenter expressed concern regarding the amount of gigawatts (4–8 GW) the WEAs in the Central Atlantic can support, and requested the maps be revised to consider a larger area so that regional and national energy goals can be met.

Multiple commenters suggested that the analysis should consider transit patterns and proximity to other offshore wind projects when determining the appropriate layout for wind projects within the chosen WEAs, and that buffers between projects or coordinated gird patterns should be considered. They also commented that there has been insufficient study of the unintended consequences that projects in this location may have on navigation, marine life, fishing, views, homeland security, military communications and costs to rate- and taxpayers. Similarly, a commenter recommended that, for a clear point of reference, WEA distances from well-known onshore locations should be listed.

A commenter suggested that BOEM develop a comprehensive planning process that removes segmentation that serves to marginalize fisheries and considers offshore wind planning options for impartial standpoints.

A commenter stated that now is not the time for offshore wind energy unless it can be proven to coexist with the fishing industry and maintain balance and equilibrium of marine ecosystems.

A commenter described how capital expenditure costs will be much higher than originally budgeted for offshore wind projects due to inflation of materials needed.

BOEM Response to Comments

The potential energy capacity that the Central Atlantic WEAs considered in this EA can support would not individually reach regional or national energy goals, and they are not intended to do so. The potential capacity that the Central Atlantic WEAs can support, in combination with the potential capacity of other planned offshore wind projects, will contribute toward reaching regional and national goals.

Vessel traffic studies that include transit pattern analysis are a required step in the development of offshore wind projects and contribute to grid layout decisions. As described in the EA, adverse impacts on military use and navigation/vessel traffic are anticipated to be negligible to minor. Distances from WEAs to shore are discussed in the EA; distances for each WEA are identified for the closest onshore location for each state (Delaware, Maryland, Virginia, and North Carolina) in Table 1-1 of the EA.

In late 2021, BOEM held a Maritime Industry Stakeholder Meeting to discuss the leasing process and the proposed Central Atlantic WEAs, which included participants from the maritime industry, including fisherman; BOEM has emphasized its commitment to transparency, collaboration, and early stakeholder engagement.

Additionally, BOEM held fisheries-specific meetings throughout 2022 that were intended to provide information and answer questions about BOEM's leasing process and the proposed Central Atlantic WEAs.

BOEM recognizes that inflation may affect the cost of materials needed for offshore wind projects.

G.2.7 Mitigation and Monitoring

Comment Summary

Many commenters requested that there be standard mitigation measures within and surrounding the WEAs. Some of the standard mitigation measures requested are mitigation or compensation for lost income, sales, or species in the fishing industry; monitoring for disturbed sediments; mitigation for cables releasing electromagnetic fields (EMF); and mitigation to protect large whales and sea turtles from offshore wind development (i.e., from vessel collision, noise impacts, and habitat displacement).

BOEM Response to Comments

In June 2022, BOEM released draft Guidelines for Mitigating Impacts to Commercial and Recreational Fisheries on the Outer Continental Shelf Pursuant to 30 CFR Part 585 (BOEM 2022). In this draft guidance, BOEM states that lessees are required to submit information regarding social and environmental impacts, such as recreational and commercial fishing, that could be affected by the lessee's proposed activities within their Site Assessment Plan (SAP) (per 30 Code of Federal Regulations [CFR] 585.611(b)(7)), within their COP (per 30 CFR 585.627(a)(7)) or within their General Activities Plan (GAP) (per 30 CFR 585.646(b)(7)). Additionally, 30 CFR 585.610(a)(8) and 585.626(b)(15) require that the SAP and COP include project-specific information, which includes the proposal of mitigation measures for avoiding, minimizing, reducing, eliminating, and monitoring environmental impacts.

Other mitigation and monitoring measures will also be proposed by a lessee in addition to those that may be proposed by BOEM, any joint signatories, Cooperating Agencies, or consulting agencies/parties. Mitigation and monitoring measures will be available in each EIS prepared for each proposed offshore wind project as an appendix and incorporated and analyzed in detail in each resource section (such as the *Commercial Fisheries and For-Hire Recreational Fishing* section) and will continue to evolve as the environmental review progresses. Mitigation and monitoring measures will be available for public review as part of each EIS during the Notice of Availability (for draft and final EIS) periods. Mitigation and monitoring are discussed generally in an EA; however, site- and project-specific mitigation and monitoring measures are discussed in detail in an EIS. When an area is leased within one of the WEAs, mitigation and monitoring measures will be proposed in the lessee's SAP/COP/GAP as part of the environmental review and incorporated into that lease area's EIS.

G.2.8 Air Quality and Greenhouse Gas Emissions

Comment Summary

One commenter requested that BOEM support states in the Central Atlantic region in setting and meeting ambitious clean energy and offshore wind capacity goals.

Several commenters requested that BOEM estimate emissions of criteria pollutants, hazardous air pollutants (HAPs), and greenhouse gases (GHGs), including those generated during vessel transit, surveys, and sampling.

One commenter requested that BOEM indicate the distance from the WEA locations to the state seaward boundary for the purpose of Outer Continental Shelf (OCS) air permitting. The commenter also requested that BOEM provide a discussion of ambient air conditions in the vicinity of the WEAs and expected cable and onshore locations, as well as identify the National Ambient Air Quality Standards (NAAQS) pollutants attainment status of the proposed lease area. Furthermore, the commenter requested that BOEM identify applicable air quality standards, provide the timeframe for the release of emissions, and discuss mitigation measures to minimize impacts on air quality. Finally, the commenter requested that BOEM identify the nearest Class I area and its distance to each WEA, as well as discuss potential impacts on Class I areas from development of the WEAs.

Several commenters requested that BOEM apply the Council on Environmental Quality (CEQ) Interim Guidance on Greenhouse Gas Emissions and Climate Change (CEQ January 2023 interim guidance), with one commenter advocating for an analysis of the social cost of greenhouse gases for the Proposed Action. The commenter also requested that BOEM minimize negative impacts and maximize benefits of offshore wind in environmental justice communities, including ensuring that construction of the Proposed Action does not create a level of pollution at any one port that could have deleterious impacts to that community.

Finally, a commenter requested that BOEM consider how climate change could influence resources in the project area and how implementation of the Proposed Action could potentially lessen or mitigate these impacts, as well as include a discussion of reasonably foreseeable effects that changes in the climate may have on the Proposed Action.

BOEM Response to Comments

BOEM acknowledges that increased wind energy development is necessary to support achievement of Federal and state clean energy policy goals. As stated in Draft EA **Chapter 2,** the Proposed Action would offer for lease all or some of the WEAs for commercial and research wind energy development and to grant rights-of-way (ROWs) and rights-of-use easement (RUEs) in support of wind energy development.

Please refer to **Appendix B, Sections B.2.1** and **B.3.1** regarding impacts of the project alternatives on air quality and greenhouse gas emissions. Annual emissions of criteria pollutants, HAPs, and GHGs from the project activities, including vessel transit, surveying, and sampling activities, are provided in **Appendix C**.

Appendix B, Section B.3.1 provides the distance from each WEA to the nearest state seaward boundary for OCS air permitting purposes and describes the NAAQS attainment status for the coastal counties nearest the Central Atlantic WEAs. Furthermore, as described in **Appendix B, Section B.3.1**, the major source thresholds for the counties/cities closest to the WEAs are used as screening levels for assessing potential air quality impacts. **Appendix B, Section B.3.1** concludes that criteria pollutant emissions associated with the Proposed Action are expected to be negligible, and mitigation measures are thus not needed to minimize impacts on air quality. Moreover, as described in **Appendix B, Section B.3.1,** the Brigantine Wilderness Area in New Jersey is the nearest Class I area, located approximately 49 miles (79 kilometers) from the closest WEA in the Central Atlantic (offshore Sussex County, Delaware). BOEM does not anticipate that Proposed Action activities in the WEAs and in the vicinity of existing ports will impact visibility in the Brigantine Wilderness Area.

The GHG analysis was prepared consistent with the CEQ January 2023 interim guidance. As described in **Appendix B, Section B.3.1,** BOEM anticipates that the combined overall impacts associated with the Proposed Action and with ongoing and reasonably foreseeable planned actions would be minor for air quality in the geographic analysis area, and planned wind projects could generate long-term, beneficial impacts by providing energy to the region from a renewable resource. **Appendix D, Section D.2.8** describes how climate change could influence resources in the project area. Because of the limited time period during which the Proposed Action would occur (approximately 2025–2030), BOEM does not expect changes in the climate to affect the Proposed Action.

G.2.9 Water Quality

Comment Summary

One commenter stated that the EA would benefit from discussion of existing conditions and impacts of the proposed onshore and offshore activities on aquatic ecosystems and that the EA should identify impairment of potentially affected waterbodies and the impacts on water quality.

BOEM Response to Comments

As described in **Appendix B** of the EA, the water quality resource has been eliminated from further consideration and is not analyzed in detail in the EA. The Proposed Action is not anticipated to increase surface water runoff or onshore surface water discharges into harbors, waterways, coastal areas, or the ocean. Any potential impacts on water resources, including from vessel discharges, sediment disturbance from geotechnical/benthic sampling and met buoy installation and decommissioning, and recovery of lost equipment, would be highly localized, short term and negligible. Impacts on water resources from any offshore wind project proposed within the Central Atlantic WEAs would be assessed in the EIS that would be prepared for the proposed offshore wind project.

G.2.10 Benthic Resources

Comment Summary

One commenter stated that benthic features should be mapped during site assessment surveys to examine the changes of benthic resources over time due to the installation of wind turbines and that the data collected should be made publicly available.

BOEM Response to Comments

Biological surveys are necessary to characterize the biological resources that could be affected by the proposed activity or could affect activities in a proposed project. Benthic habitat, avian, bat, and marine fauna surveys are all expected as part of the Proposed Action. Biological survey activities associated with the Proposed Action are described in EA **Table 2-7**. Detailed benthic surveys and assessment of potential impacts on benthic resources would be conducted by lessees in support of the EIS that would be prepared for each proposed offshore wind installation project.

G.2.11 Finfish, Invertebrates, and Essential Fish Habitat

Comment Summary

Many commenters expressed concern regarding potential impacts on submerged aquatic vegetation (SAV) and Habitat Areas of Particular Concern (HAPCs) for summer flounder.

One commenter requested the EA to address potential impacts from EMF on elasmobranchs.

One commenter requested documents and consultations pertaining to Section 7 of the Endangered Species Act be included in the EA.

One commenter expressed concern for marine life and damage to the marine ecosystem due to the installation of wind turbine structures.

Several commenters expressed concern for the disruption of horseshoe crab habitat and the subsequent impact on the medical industry that uses horseshoe crab blood for testing.

Several commenters expressed concern for the protection of deep sea coral.

BOEM Response to Comments

The Proposed Action (WEAs) would not necessarily result in any installation of wind turbine structures, and installation of any proposed wind turbine projects would depend upon (a) whether BOEM receives and accepts bids from lessees and (b) whether BOEM issues approval of lessee submittals. An EIS would be prepared for any proposed wind turbine installation within any Central Atlantic WEA; that EIS would assess potential impacts of the installation on marine ecosystems.

The purpose of the Proposed Action is to issue commercial leases within the WEAs, and grant ROWs and RUEs in the region of the OCS of the Central Atlantic. The EA does not consider construction and operation of any commercial wind power facilities, which would be evaluated if a lessee submits a COP.

SAV has been identified as a HAPC for both juvenile and adult summer flounder (also known as fluke) (see EA **Sections 3.3.3** and **3.4.3**). However, only a small number of geotechnical and benthic samples would be taken within inshore areas (including within HAPCs) associated with the potential transmission cable routes, and sampling would be subject to state-specific permit conditions relative to the undetermined transmission cable route (see EA **Section 3.4.3**).

The Proposed Action would not result in generation of EMFs affecting the seabed. Potential impacts of EMF on the seabed for proposed wind energy installations would be assessed in the EIS prepared for each proposed wind energy installation.

Documents and consultations pertaining to Section 7 of the Endangered Species Act are included in the EA (e.g., Anderson, 2021; Baker K, Howson U, 2021; NMFS 2013; NMFS 2020a; NMFS 2023).

Biological surveys are necessary to characterize the biological resources that could be affected by the proposed activity or could affect activities in a proposed project. Benthic habitat, avian, bat, and marine fauna surveys are all expected as part of the Proposed Action. Biological survey activities associated with the Proposed Action are described in EA **Table 2-7**. Detailed marine fauna surveys and assessment of potential impacts on marine fauna would be conducted by lessees in support of the EIS that would be prepared for each proposed offshore wind installation project.

G.2.12 Marine Mammals

Comment Summary

Many commenters expressed concern regarding the long-term effects of turbine presence and underwater noise on marine mammals. Commenters also expressed support for quiet foundation technologies such as gravity-based or suction bucket foundations.

Multiple commenters expressed concern regarding the whale and dolphin deaths along the Atlantic coast. Commenters also raised concerns regarding the take of marine mammals.

Several commenters expressed concern on wind turbine disruption to prey availability for North Atlantic right whales.

Several commenters recommended incorporating mitigation measures including establishing a marine mammal exclusion zone and passive acoustic monitoring during site characterization and site assessment activities to minimize negative impacts on protected species.

A commenter also expressed concern regarding the cumulative impacts on marine mammals.

BOEM Response to Comments

The purpose of the Proposed Action is to issue commercial leases within the WEAs and grant ROWs and RUEs in the region of the OCS of the Central Atlantic. The EA does not consider construction and operation of any commercial wind power facilities, which would be evaluated if a lessee submits a COP.

BOEM submitted a literature review to the National Marine Fisheries Service (NMFS) as supporting documentation in reference to the 2021 completed programmatic consultation with NMFS from June 29, 2021. Consultation with NMFS is still ongoing. The required marine mammal mitigation measures will be developed collaboratively with NMFS, BOEM, and others to avoid impacts to the greatest degree practicable and to provide protections against the most severe types of impacts.

G.2.13 Bats and Avian Species

Comment Summary

A commenter noted that impacts of offshore wind on bird and bat strike mortality is still being assessed and encourages the use of bird and bat monitoring technologies during the construction of future electrical service platforms and wind turbine generators.

A commenter noted that the wind energy areas are within the Atlantic Flyway, and recommends conducting research and implementing a mitigation and monitoring plan.

BOEM Response to Comments

BOEM is conducting ongoing consultation with the United States Fish and Wildlife Service to assess impacts of lease issuance on birds and bats, and other species located within the Proposed Action area that are covered under the Endangered Species Act Section 7. The Draft EA does not consider construction and operation of any commercial wind power facilities, which would be evaluated if a lessee submits a COP.

G.2.14 Sea Turtles

Comment Summary

A commenter expressed concern about increased sea turtle mortality.

Several commenters expressed concern for data gaps regarding the impacts of offshore wind energy development on sea turtles and requests for best scientific information to be considered.

BOEM Response to Comments

BOEM submitted a literature review to NMFS as supporting documentation in reference to the 2021 completed programmatic consultation with NMFS from June 29, 2021. Consultation with NMFS is still ongoing.

NMFS’ conclusion (Anderson 2021) is consistent with previous analyses of effects on sea turtles related to lease issuance and site characterization (including meteorological buoys) as described in the NMFS Geological and Geophysical (G&G) Biological Opinion (NMFS 2013). The analysis in the NMFS G&G Biological Opinion 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 DPS loggerhead sea turtles surviving and recovering in the wild (NMFS 2013).

G.2.15 Military Use

Comment Summary

No substantive comments received.

BOEM Response to Comments

Not applicable.

G.2.16 Navigation and Vessel Traffic

Comment Summary

Commenters expressed support of arguments that if USCG would agree with fairway route adjustments, then BOEM should explore rewidening of the WEA. A commenter expressed support for continued offshore wind development as long as the WEAs do not encroach on the available sea space needed for fairways that are safe for navigation, wind farms, and the environment. A commenter expressed concern that the Consolidated Port Approaches Port Access Route Studies appear to pose challenges to the viability of offshore wind development near Maryland and Delaware. A commenter stated that the EA must include a safe transit alternative during meteorological (met) buoy operations, and that site selection should be a collaborative effort between stakeholders and government officials. This commenter also states that potential impacts on navigation for commercial and recreational fishing near the WEAs must be analyzed.

One commenter suggested that transit patterns should be considered when determining the appropriate layout for wind projects.

Commenters noted that vessel speed restrictions have been proven to reduce mortalities of large mammals from vessel collisions, and forwarded mitigation recommendations for the construction period.

BOEM Response to Comments

BOEM maintains continuous lines of communication with USCG and is following their recent Port Access Route Study processes as USCG works to designate shipping safety fairways along the Atlantic.

Vessel traffic studies that include transit pattern analysis are a required step in the development of offshore wind projects and contribute significantly to grid layout decisions. The Draft EA does not consider construction and operation of any commercial wind power facilities, which would be evaluated if a lessee submits a COP for proposed development in any of the WEAs.

G.2.17 Commercial and Recreational Fishing

Comment Summary

A few commenters expressed concern for safety of commercial and recreational fishers throughout the offshore wind area and requested a training program for mariners.

A few commenters expressed concern for the impact that construction of the lease area would have on fishing tournaments in Ocean City near WEA B-1.

A commenter is requesting guidance for compensation for missing boating seasons in Ocean City, Maryland, due to construction in the lease areas.

The MAFMC and NEFMC request access to data viewers that show specific data and information so they can be more effective partners with NOAA Fisheries on EFH consultations.

A commenter stated the importance of BOEM working with NOAA Fisheries to develop appropriate fishing and habitat data to inform the development of alternatives, impacts analysis, and potential mitigation measures.

Many commenters expressed concern regarding fishers losing their livelihoods due to wind development.

A commenter stated that the economic impact on commercial and recreational fishing should be carefully assessed, and avoidance and mitigation of impacts should be considered where possible.

Several commenters expressed concern about the Atlantic surfclam fishery overlap with WEA A-2 and WEA C-1. Another commenter expressed the importance of seeding efforts as mitigation for the Atlantic surfclam.

A commenter requested that BOEM include a lease requirement during the sale notice requiring lessees to adhere to the Draft BOEM Fisheries Mitigation Guidance for establishment of fisheries compensation funds.

A commenter requested the installation of acoustic monitoring technology on stationary structures, such as met buoys used during site assessment activities.

BOEM Response to Comments

An EA is done to determine whether or not an action is a "major federal action significantly affecting the quality of the human environment" (42 United States Code [U.S.C.] 4332 2(C)). The EA is intended to be brief but thorough and is not intended to be an exhaustive listing of resources that could be affected by an action, but rather it is intended to highlight and focus on those resources that could most likely be affected by the Proposed Action. The Draft EA analyzes potential effects on prominent fisheries in the Central Atlantic but is not intended to be a comprehensive list of all managed fisheries in the region. **Section 4.2.2** of the Draft EA includes descriptions of the commercial and recreational fishery resources (i.e., within the No Action Alternative).

The EA does not consider construction and operation of any commercial wind power facilities, which would be evaluated if a lessee submits a COP for proposed development in any of the WEAs.

G.2.18 Recreation and Tourism

Comment Summary

A commenter requested that the economic impact of recreational fishing impacts be fully assessed within the EA.

BOEM Response to Comments

Economic impacts on recreational anglers are not anticipated as a result of the Proposed Action. Potential impacts on recreational anglers as a result of the Proposed Action include the risk of recreational vessel allision with in-water structures, fishing gear entanglement, vessel damage or loss, increased navigation hazards, vessel traffic congestion, space-use conflicts, and presence of cables and infrastructure. Offshore anglers may choose different fishing locations or routes to avoid in-water structures; however, because offshore structures associated with the Proposed Action are limited to met buoys, substantial or long-term conflicts are not anticipated.

Potential economic impacts on for-hire recreational fisheries is included in **Section 3.4.2**.

G.2.19 Cultural, Historical, and Archaeological Resources

Comment Summary

Commenters noted that the Proposed Action may affect historic and cultural resources, and therefore BOEM is obligated to fulfill Section 106 of the National Historic Preservation Act (NHPA). The USACE authorized BOEM to conduct Section 106 on its behalf and requested to be invited to participate in all NHPA Section 106 consultation meetings. USEPA suggested that BOEM include information in its analysis regarding known historic resources. USEPA also recommended that BOEM consult with State Historic Preservation Officers (SHPOs) as soon as possible regarding identification of archaeological resources and assessment of potential impacts in the wind energy areas.

BOEM Response to Comments

BOEM thanks the commenters for their comments and notes that it initiated the NHPA Section 106 consultation process with SHPOs and has invited over 90 parties, including the USACE, to participate as a consulting party. BOEM will continue to consult with NHPA Section 106 consulting parties throughout the life of the Project. BOEM has also been in consultation with SHPOs and has identified all known historic properties within the area of potential effects and has analyzed effects from the undertaking onto these properties in the Finding of Effect and the EA.

G.2.20 General Support or Opposition

Comment Summary

Many commenters expressed support or opposition to the Proposed Action. Some commenters, rather than expressing stringent support or opposition, provided recommendations to ensure the Proposed Action limits the impacts on marine mammals.

Commenters who are in support of the Proposed Action expressed that the project would have the "game changing" potential to increase clean energy production and will help reach President Biden's goal for offshore wind energy production by 2030. Commenters also stated that there is local demand and load center growth that will support the addition of offshore wind energy, and that there are already deep-water ports along the Central Atlantic coast that can support offshore wind. Additionally, commenters expressed support and look forward to job growth in their communities because of the Proposed Action. Other commenters expressed their appreciation to BOEM for stakeholder engagement through the offshore wind development process.

Commenters who are not in support of the Proposed Action expressed that this project was not voted on by the people, and stated that many of their local elected officials are not in favor of the Proposed Action.

Additionally, commenters mentioned that the project falls short of reaching state-level wind energy goals, especially when the energy produced by the Proposed Action will be shared across multiple states.

BOEM Response to Comments

Comments in support of, or opposition to, the WEAs in the Central Atlantic, are noted.

The potential energy capacity that the Central Atlantic WEAs considered in this EA can support would not individually reach regional or national energy goals, and are not intended to do so. The potential capacity that the Central Atlantic WEAs can support, in combination with the potential capacity of other planned offshore wind projects, will contribute toward reaching regional and national goals.

G.2.21 Regulatory Compliance

Comment Summary

The Commonwealth of Virginia Office of Environmental Impact Review requested that BOEM notify their office when environment documents are ready for review, as well as that shapefiles be included with the NEPA documentation. The office states that the possibility of an EIS should not be overlooked for this project. The office provided a list of online databases that may assist in the preparation of the EA.

USACE commented that they authorize BOEM to conduct the Magnuson-Stevens Fishery Conservation and Management Act (MFCMA) consultation with NMFS on their behalf.

BOEM Response to Comments

Shapefiles regarding the Proposed Action are included on BOEM's website. Additionally, when the environmental documents are completed for review, notification of the documents will be published on BOEM's website as well as in the *Federal Register*.

The NMFS EFH-A consultation under the MFCMA is being conducted by BOEM and will be presented in coordination with the other environmental documents needed for the Proposed Action.

G.2.22 Out of Scope

Comment Summary

Virginia Department of Health – Office of Drinking Water stated that the Proposed Action is not close to any public groundwater wells or surface water intakes, or within a watershed of surface water intakes, and that there are no impacts on public drinking water.

Two commenters expressed that they were pleased to see that the final WEAs avoided overlap (by not identifying WEAs within call areas E and F) with deepwater areas, specifically deep sea coral zones.

BOEM Response to Comments

BOEM appreciates the Virginia Department of Health – Office of Drinking Water's review and acknowledgement that the public drinking water systems will not be impacted by the project.

G.3 References

Anderson J. 2021. Letter to J.F. Bennett concerning the effects of certain site assessment and site characterization activities to be carried out to support the siting of offshore wind energy development projects off the U.S. Atlantic Coast. Gloucester (MA): U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 68 p.

BOEM. 2022. Guidelines for Mitigation Impacts to Commercial and Recreational Fisheries on the Outer Continental Shelf Pursuant to 30 CFR Part 585. Available: https://www.boem.gov/sites/default/files/documents/renewable-energy/DRAFT%20Fisheries%20Mitigation%20Guidance%2006232022_0.pdf. Accessed October 13, 2023.

NMFS. 2013. Endangered Species Act Section 7 consultation biological opinion. Commercial wind lease issuance and site assessment activities on the Atlantic Outer Continental Shelf in Massachusetts, Rhode Island, New York and New Jersey Wind Energy Areas. Gloucester (MA): National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Greater Atlantic Regional Fisheries Office. 255 p. Report No.: NER-2012-9211, GARFO-2012-00011

Appendix H: Standard Operating Conditions

This section lists the Standard Operating Conditions (SOCs) that are part of the Proposed Action. The SOCs to minimize or eliminate potential impacts on protected species, including Endangered Species Act (ESA)-listed species of marine mammals and sea turtles, were developed by the Bureau of Ocean Energy Management (BOEM) and refined during consultations with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) under Section 7 of the ESA.

1 General Requirements

1.1 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.

1.2 The Lessee must ensure that all vessel operators and crew members, including PSOs, are familiar with, and understand, the requirements specified in Addendum C of the lease.

1.3 Endangered Species Act (ESA) Consultation for Biological Surveys: The Lessee must consult with BOEM, NMFS, and USFWS prior to designing and conducting a literature review intended to support offshore renewable energy plans that could interact with ESA-listed species.

2 Protected Species

2.1 Protected Species. Unless otherwise authorized by BOEM or BSEE, Lessee's Outer Continental Shelf (OCS) activities must adhere to the standards outlined in the most recent literature review, as well as any measures for the protection of endangered and protected species developed during ESA Section 7 consultation with NMFS, USFWS, in effect at the time the activity is initiated under this lease.

3 Archaeological Survey Requirements

3.1 Archaeological Survey Required. The Lessee must provide the results of an archaeological survey with its plans.

3.2 Qualified Marine Archaeologist. The Lessee must ensure that the analysis of archaeological survey data collected in support of plan (e.g., Site Assessment Plan [SAP] and/or Construction and Operations Plan [COP]) submittal and the preparation of archaeological reports in support of plan submittal are conducted by a Qualified Marine Archaeologist.

3.3 Tribal Pre-Survey Meeting. The Lessee must coordinate a tribal pre-survey meeting by sending a letter through certified mail, and following up with email or phone calls as necessary, to the following Tribes:

- Shawnee Tribe of Indians of Oklahoma
- Catawba Indian Nation
- Chickahominy Indian Tribe
- Chickahominy Indian Tribe-Eastern Division

- Delaware Tribe of Indians
- Eastern Band of Cherokee Indians
- Eastern Shawnee Tribe of Oklahoma
- Mashantucket (Western) Pequot Tribe
- Mashpee Wampanoag Tribe
- Mohegan Tribe of Connecticut
- Nansemond Indian Nation
- Pamunkey Indian Tribe
- Rappahannock Tribe
- Seminole Tribe of Florida
- Shawnee Tribe
- Stockbridge-Munsee Community Band of Mohican Indians
- The Delaware Nation
- The Narragansett Indian Tribe
- The Shinnecock Indian Nation
- Tuscarora Nation
- Upper Mattaponi Indian Tribe
- Wampanoag Tribe of Gay Head (Aquinnah),
- United Keetoowah Band of Cherokee Indians

The purpose of this meeting will be for the Lessee and the Lessee's Qualified Marine Archaeologist to discuss the Lessee's Survey Plan and consider requests to monitor portions of the archaeological survey and the geotechnical exploration activities, including the visual logging and analysis of geotechnical samples (e.g., cores). Notification of the tribal pre-survey meeting must be sent at least 15 calendar days prior to the date of the proposed tribal pre-survey meeting. The -re-survey meeting must be scheduled for a date at least 30 calendar days prior to commencement of survey activities performed in support of plan submittal and at a location and time that affords the participants a reasonable opportunity to participate. The anticipated date for the meeting must be identified in the timeline of activities described in the applicable survey plan (see Section 2.1 of the lease). The Lessee must provide the Lessor with documentation of compliance with this stipulation prior to commencement of surveys.

3.4 Geotechnical Exploration. The Lessee may only conduct geotechnical exploration activities performed in support of plan (i.e., SAP and/or COP) submittal in locations where an analysis of the results of geophysical surveys has been completed. This analysis must include clearance for unexploded ordinance, and a determination by a Qualified Marine Archaeologist as to whether any potential archaeological resources are present in the area. Except as allowed by the Lessor under Section 4.2.6 of the lease, the geotechnical exploration activities must avoid potential archaeological resources by a minimum of 50 meters (164 feet), and 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, that geotechnical exploration activities did not impact potential historic properties identified as a result of the high-resolution geophysical (HRG) surveys performed in support of plan submittal, except as follows: in the event that the geotechnical exploration activities did impact potential historic properties identified in the archaeological surveys without the Lessor’s prior approval, the Lessee and the Qualified Marine Archaeologist who prepared the report must instead provide a statement documenting the extent of these impacts.

3.5 Monitoring and Avoidance. The Lessee must inform the Qualified Marine Archaeologist that he or she may elect to be present during HRG surveys and bottom-disturbing activities performed in support of plan (i.e., SAP and/or COP) submittal to ensure avoidance of potential archaeological resources, as determined by the Qualified Marine Archaeologist (including bathymetric, seismic, and magnetic anomalies; side-scan sonar contacts; and other seafloor or sub-surface features that exhibit potential to represent or contain potential archaeological sites or other historic properties). In the event that the Qualified Marine Archaeologist indicates that he or she wishes to be present, the Lessee must reasonably facilitate the Qualified Marine Archaeologist's presence, as requested by the Qualified Marine Archaeologist, and provide the Qualified Marine Archaeologist the opportunity to inspect data quality.

3.6 No Impact without Approval. In no case may the Lessee knowingly impact a potential archaeological resource without the Lessor's prior approval.

3.7 Post-Review Discovery Clauses. If the Lessee, while conducting geotechnical exploration or any other bottom-disturbing site characterization activities in support of plan (i.e., SAP and/or COP) submittal and after review of the location by a Qualified Marine Archaeologist under Section 4.2.4 of the lease, discovers an unanticipated 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) or evidence of a pre-contact archaeological site (e.g. stone tools, pottery or other pre-contact artifacts) within the project area, the Lessee must:

3.7.1 Immediately halt seafloor/bottom-disturbing activities within the area of discovery;

3.7.2 Notify BOEM and BSEE (TIMSWeb and notification email to env-compliance-arc@bsee.gov) within 24 hours of discovery;

3.7.3 Notify BOEM and BSEE in writing via report to BOEM and BSEE (TIMSWeb and notification email to env-compliance-arc@bsee.gov) within 72 hours of its discovery;

3.7.4 Keep the location of the discovery confidential and take no action that may adversely impact the archaeological resource until the Lessor has made an evaluation and instructs the applicant on how to proceed; and

3.7.5 If (1) the site has been impacted by the Lessee's project activities or (2) impacts on the site or on the area of potential effect cannot be avoided, conduct additional investigations, as directed by the Lessor, to determine if the resource is eligible for listing in the National Register of Historic Places (30 Code of Federal Regulations [CFR] 585.802(b)). If investigations indicate that the resource is potentially eligible for listing in the National Register of Historic Places, the Lessor will inform 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, then, under Section 110(g) of the National Historic Preservation Act, the Lessor may charge the Lessee reasonable costs for carrying out preservation responsibilities under the OCS Lands Act (30 CFR 585.802(c-d)).

4 Avian and Bat Survey and Reporting Requirements

4.1 Lighting: Consistent with, and not conflicting with, any measures that may result from USCG requirements, the Lessee must use any additional lighting only when necessary, and such lighting must be hooded downward and directed, when possible, to reduce upward illumination and the illumination of adjacent waters.

4.2 Motus Wildlife Tracking System: To help address information gaps on offshore movements of birds and bats, including ESA-listed species, the Lessee must install Motus stations on meteorological or environmental data buoys in coordination with the USFWS's Offshore Motus network.

4.3 Bird Deterrents: To minimize the attraction of birds, the Lessee must install bird deterrent devices (e.g., anti-perching), where appropriate. The Lessee will include a description of the type and location of the deterrents in their SAP.

4.4 Avian Annual Reporting: The Lessee must provide an annual report BOEM, BSEE (TIMSWeb with notification email to protectedspecies@bsee.gov), and USFWS using the contact information provided as an Enclosure to the lease, or updated contact information as provided by the Lessor. This report must document any dead or injured birds or bats found during activities conducted in support of plan submittal. The first report must be submitted within 6 months of the start of the first survey conducted in support of plan submittal, and subsequent reports must be submitted annually thereafter until all surveys in support of plan submittal have concluded and all such birds and bats have been reported. If surveys are not conducted in a given year, the annual report may consist of a simple statement to that effect. An annual report must be provided to BOEM, BSEE, and USFWS documenting any dead or injured birds or bats found on vessels and structures during construction, operations, and decommissioning. The 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. Carcasses with Federal or research bands must be reported to the United States Geological Survey Bird Band Laboratory, available at https://www.usgs.gov/centers/eesc/science/bird-banding-laboratory.

4.5 Survey Results and Data: The Lessee must provide the results of avian surveys and data to BOEM and USFWS with its plans.

U.S. Department of the Interior

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

Bureau of Ocean Energy Management

The mission of the Bureau of Ocean Energy Management is to manage development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way. The bureau promotes energy independence, environmental protection, and economic development through responsible management of these offshore resources based on the best available science.