Commercial and Research Wind Lease and Grant Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf of the New York Bight

Draft Environmental Assessment

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Commercial and Research Wind Lease and Grant Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf of the New York Bight

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Executive Summary

ES.1 Purpose and Need for Action

On March 29, 2021, the Bureau of Ocean Energy Management (BOEM) released the Announcement of Area Identification (Area ID) Memorandum on the analysis and rationale used to develop the Wind Energy Areas (WEAs) in the New York Bight (NY Bight) (BOEM 2021a). The purpose of the Proposed Action is to assess the physical characteristics of areas on the Outer Continental Shelf (OCS) of the NY Bight through the issuance of commercial and research leases within the WEAs and granting of rights-of-way (ROWs) and rights-of-use and easement (RUEs) in the region. The WEAs considered in this environmental assessment (EA) are depicted in **Figure ES-1**.

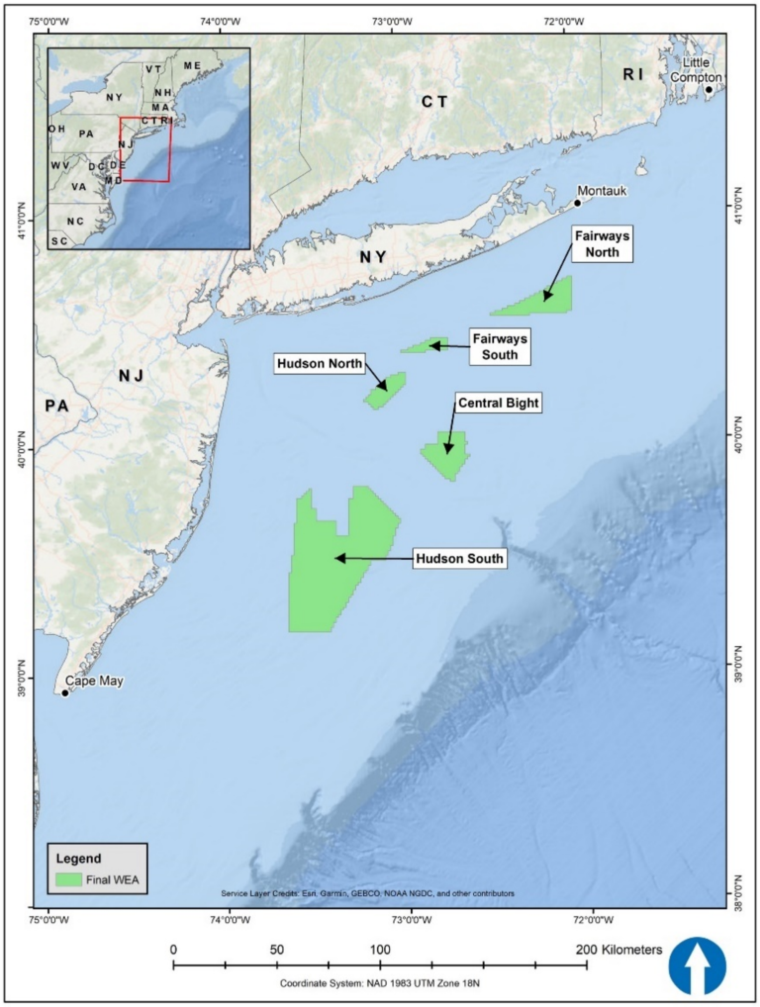

Figure ES-1. New York Bight Wind Energy Areas (WEAs)

BOEM's issuance of these leases and grants is needed: (a) to 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 develop plans for BOEM's review; and (b) 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 and research wind energy leases within the WEAs that BOEM has designated on the OCS in the NY Bight, and the granting of ROWs and RUEs in support of wind energy development. This EA analyzes BOEM's issuance of up to 10 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 NY Bight and would 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. Site assessment activities would most likely include the temporary placement of meteorological buoys (i.e., met buoys) and oceanographic devices. Site characterization activities would most likely include geophysical, geotechnical, and biological surveys.

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 NY Bight at this time. Site characterization 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 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, and between the WEAs and shore along the potential transmission cable corridors.

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 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 and 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 NY Bight 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**). 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 activities (**Section 3**).

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

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	Minor	Negligible
Commercial and Recreational Fishing	Negligible to Minor	Negligible to Minor	Negligible
Cultural, Historical, and Archaeological Resources	Negligible	Negligible	Negligible
Finfish, Invertebrates, and Essential Fish Habitat (EFH)	Negligible	Negligible to Minor	Negligible
Marine Mammals	Negligible (except for ESA-listed marine mammals, which are Minor to Moderate)	Negligible to Minor (except for ESA-listed marine mammals which are Minor to Moderate)	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 met buoy deployment, operation, and decommissioning; site characterization activities include biological, geological, geotechnical, and archaeological surveys.

ES.5 Notice to Stakeholders and Comment Period

A Notice to Stakeholders issued in conjunction with the publication of this draft EA initiates a 30-day public comment period. Comments can be submitted via www.regulations.gov under docket ID **BOEM-2021-0054**. During the comment period, virtual public meetings will be held to exchange information between BOEM, stakeholders, and the general public. Current information about the project and public meetings is available online at www.boem.gov/renewable-energy/state-activities/new-york-bight.

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List of Abbreviations and Acronyms

§	section
µpa	micropascal
Area ID	Announcement of Area Identification
BOEM	Bureau of Ocean Energy Management
Call	Call for Information and Nominations
CD	Consistency Determination
CEQ	Council on Environmental Quality
CHIRP	Compressed High-Intensity Radar Pulse
COP	Constructions and Operations Plan
CPT	cone penetration test
dB	decibel
DOD	Department of Defense
EA	environmental assessment
EFH	Essential Fish Habitat
ESA	Endangered Species Act
G&G	geological and geophysical
HAPC	Habitat Area of Particular Concern
HF	high-frequency cetacean
HRG	high-resolution geophysical survey
IMO	International Maritime Organization
IPF	impact-producing factor
ITA	incidental take authorization
LF	low-frequency
MAFMC	Mid-Atlantic Fishery Management Council
MMPA	Marine Mammal Protection Act
MMS	Marine Minerals Service
NARW	North Atlantic right whale
NEFMC	New England Fishery Management Council
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWP	Nationwide Permit
NY Bight	New York Bight
NYSERDA	New York State Energy Research and Development Authority
OCS	Outer Continental Shelf
OPAREA	operating area
OREP	Office of Renewable Energy Programs
PARS	Port Access Route Study
PDCs	project design criteria
PEIS	Programmatic Environmental Impact Statement

PK	zero-to-peak sound pressure level
PPS	pulses per second
PSN	Proposed Sale Notice
PSO	protected species observer
PTS	permanent threshold shift
re	referenced to
ROW	right-of-way
RUE	right-of-use
SAP	Site Assessment Plan
SAV	submerged aquatic vegetation
SBP	sub-bottom profiler
SEL	sound exposure level
SHPO	State Historic Preservation Office
SL	source level
SOC	standard operating condition
SPI	sediment profile imagery
SPL	sound pressure level
TSS	Traffic Separation Scheme
USACE	U.S. Army Corps of Engineers
USBL	ultra-short baseline
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
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 New York Bight (NY Bight) would lead to reasonably foreseeable significant impacts on the environment and, thus, whether an environmental impact statement should be prepared before a lease is issued.

On March 29, 2021, the BOEM released the Announcement of Area Identification (Area ID) (BOEM 2021a). The Area ID Memorandum documents the analysis and rationale used to develop the WEAs in the NY Bight.

The purpose of the Proposed Action is to assess the physical characteristics of areas of the Outer Continental Shelf (OCS) of the NY Bight through the issuance of commercial and research leases within the WEAs and granting of rights-of-way (ROWs) and rights-of-use and easement (RUEs) in the region. BOEM's issuance of these leases and grants is needed (a) to confer the exclusive right to submit plans to BOEM for potential development, such that the lessees and grantees 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 develop plans for BOEM's review; and (b) to impose terms and conditions intended to ensure that site characterization and assessment activities are conducted in a safe and environmentally responsible manner.

Based on the process described in the Area ID Memorandum (BOEM 2021a), the WEAs considered in this EA are described in **Table 1** and depicted in **Figure 1**.

Table 1. NY Bight Wind Energy Areas (WEAs) descriptive statistics

Parameter	Fairways North WEA	Fairways South WEA	Hudson North WEA	Central Bight WEA	Hudson South WEA	Total
Acres	88,246	23,841	43,056	84,688	567,552	807,383
Maximum depth (m)	56	46	45	61	59	--
Minimum depth (m)	42	39	41	52	32	--
Closest distance to New York (nm)	15	15	21	38	45	--
Closest distance to New Jersey (nm)	69	45	36	53	23	--

-- = not applicable; WEA = Wind Energy Area.

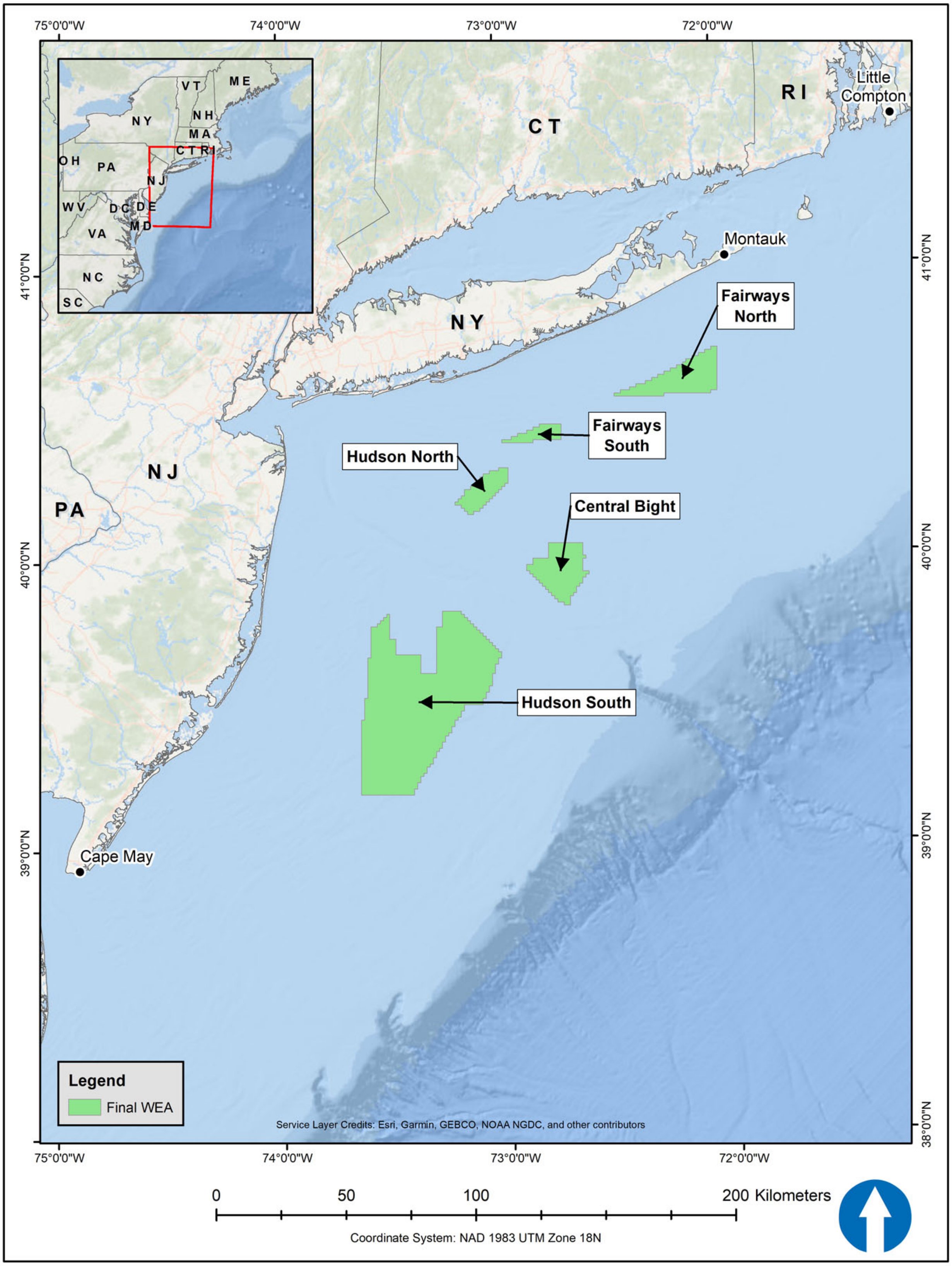

Figure 1. NY Bight Wind Energy Areas (WEAs)

2 Proposed Action

The Proposed Action for this EA is the issuance of commercial and research wind energy leases within the WEAs that BOEM has designated on the OCS in the NY Bight and the granting of ROWs and RUEs in support of wind energy development. This EA analyzes BOEM's issuance of up to 10 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 NY Bight 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. Site assessment activities would most likely include the temporary placement of meteorological buoys (i.e., met buoys) and oceanographic devices. Activities included within the Proposed Action of this EA do not include the installation of meteorological towers since 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 the lessee submits a 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 an SAP and COP proposing development of the leasehold; the lease does not, by itself, authorize any activity within the lease area. After lease issuance, a lessee would conduct surveys and, if authorized to do so pursuant to an approved SAP, install meteorological measurement devices 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 state, Federal, local, and tribal entities; solicit input from the public and the Task Force; and perform an independent, comprehensive, site- and project-specific NEPA analysis. This separate site- and project-specific NEPA analysis may take the form of an EIS and would provide additional opportunities for public involvement pursuant to NEPA and the CEQ regulations at 40 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 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 survey activities. Under the reasonably foreseeable site characterization scenario, BOEM could issue leases as early as late 2021 and continue through late 2022. It is assumed lessees would begin survey activities as soon as possible after receiving a lease, preparing a Site Assessment Plan (SAP) 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 late 2021, the earliest surveys would likely begin no sooner than April 2022. 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 late 2022, those lessees' surveys could continue through August 2027 prior to submitting their COPs.

Of the alternatives considered in this EA, Alternative A is the No Action Alternative. Alternative B, the Proposed Action, would result in site characterization and assessment activities in the identified WEAs of the NY Bight and along transmission cable corridors to shore. Both alternatives were analyzed by BOEM, in full, in this EA. The alternatives are described in **Section 3**.

2.1 Information Considered and Supporting National Environmental Policy Act Evaluations

Information considered in scoping this EA includes the following:

- Comments received in response to the April 11, 2018, Call for Information and Nominations (Call) associated with wind energy planning in the NY Bight
- Public response to the March 29, 2021, Notice to Stakeholders to prepare this EA
- Ongoing consultation and coordination with the members of BOEM's NY Bight 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), U.S. Department of Defense (DOD), and U.S. Coast Guard (USCG)
- New York State Energy Research and Development Authority (NYSERDA) completed studies and surveys[1]
- Research and review of current relevant National Environmental Policy Act (NEPA) documents that assess similar activities, as well as relevant scientific and socioeconomic literature (**Table 2**)

[1] Available at www.nyserda.ny.gov/About/Publications/Offshore-Wind-Plans-for-New-York-State

Table 2. Relevant regulatory documents and literature considered and incorporated by reference in this environmental assessment

Reference	Link
Other Relevant Lease Issuance Environmental Assessments (EAs)	
BOEM. 2016. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York, Revised Environmental Assessment. 449 p. Report No.: OCS EIS/EA BOEM 2016-070.	www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/NY/NY_Revised_EA_FONSI.pdf
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
BOEM. 2014. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts, Revised Environmental Assessment. 674 p. Report No.: OCS EIS/EA BOEM 2014-603.	www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/MA/Revised-MA-EA-2014.pdf
BOEM. 2013. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts, Revised Environmental Assessment. 417 p. Report No.: OCS EIS/EA BOEM 2013-1131.	www.boem.gov/sites/default/files/uploadedFiles/BOEM/Renewable_Energy_Program/Smart_from_the_Start/Mid-Atlantic_Final_EA_012012.pdf
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
Other Relevant Wind Energy Documents	
MMS. 2007. Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement. 4 vols. Report No.: OCS EIS/EA MMS 2007-046.	www.boem.gov/renewable-energy/guide-ocs-alternative-energy-final-programmatic-environmental-impact-statement-eis
Parsons G, Firestone J. 2018. Atlantic Offshore Wind Energy Development: Values and Implications for Recreation and Tourism. Sterling (VA): US 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
ICF Incorporated, LLC. 2012. Atlantic Region Wind Energy Development: Recreation and Tourism Economic Baseline Development. Herndon, VA: U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. 35 p. Report No.: OCS Study BOEM 2012-085.	espis.boem.gov/final%20reports/5228.pdf

Reference	Link
BOEM. 2015b. Virginia Offshore Wind Technology Advancement Project on the Atlantic Outer Continental Shelf Offshore Virginia, Revised Environmental Assessment. 239 p. Report No.: OCS EIS/EA BOEM 2015-031.	www.energy.gov/sites/default/files/2016/03/f30/EA-1985-FEA-2015_1.pdf
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
Klein JI, Harris MD, Tankersley WM, Meyer R, Smith GC, Chadwick WJ. 2012. Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits. Volume I: Technical Report of Findings; Volume II: Appendices. 2 vols. 726 p. Report No.: OCS Study BOEM 2012-006.	Vol I: espis.boem.gov/final%20reports/5249.pdf Vol II: espis.boem.gov/final%20reports/5250.pdf
Other Relevant Survey Activity NEPA Evaluations	
BOEM. 2014. Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas. Final Programmatic Environmental Impact Statement. 3 vols. 2158 p. Report No.: OCS EIS/EA BOEM 2014-001.	www.boem.gov/oil-gas-energy/atlantic-geological-and-geophysical-gg-activities-programmatic-environmental-impact
Other Relevant Affected Environment Documents	
NYDOS. 2013. New York Department of State Offshore Atlantic Ocean Study. Albany, NY. 144 p.	docs.dos.ny.gov/communitieswaterfronts/ocean_docs/NYSDOS_Offshore_Atlantic_Ocean_Study.pdf
Geo-Marine Inc. 2010. New Jersey Department of Environmental Protection Ocean/Wind Power Ecological Baseline Studies, Final Report. 4 vols. 923 p. Report No.: January 2008-December 2009.	www.nj.gov/dep/dsr/ocean-wind/
Normandeau Associates, APEM Inc. 2019. Digital Aerial Baseline Survey of Marine Wildlife in Support of Offshore Wind Energy. ReMOTe: Remote Marine and Onshore Technology. New York State Energy Research Development Authority.	remote.normandeau.com/portal_data.php?pj=6&public=1

BOEM = Bureau of Ocean Energy Management; MMS = Minerals Management Service; NYDOS = New York Department of State; OCS = Outer Continental Shelf; OREP = Office of Renewable Energy Programs.

2.2 Foreseeable Activities and Impact-Producing Factors

This analysis covers 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 3**), and site assessment activities (i.e., met buoy deployment, operation, and decommissioning) within the WEAs and potential easements associated with transmission cable corridors. This analysis 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.

Impact-producing factors (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
Habitat Degradation	Entanglement

The IPFs associated with each routine and non-routine activity are provided in the following subsections.

Table 3. Proposed Action scenario assumptions

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/sub-bottom 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)

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. BOEM's assumptions for the Proposed Action (Alternative B) scenario in this EA are summarized below in **Table 4** and estimated quantification of survey effort is provided in **Appendix A**. These scenarios are 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 2.1**), 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 4. Assumptions for the Proposed Action (Alternative B) scenario to determine the level of effort required for site assessment and site characterization activities

Overall Scenario Assumptions
BOEM would issue 10 leases in the WEAs, at 80,000 acres each (in WEAs large enough to achieve this).
A lessee would install two met buoys per lease.
There will be two export cable route corridors per lease.
A backbone transmission system with offshore converter collector platforms (platforms located within the cable corridors) could be granted an easement.
Surveying and Sampling Assumptions
Site characterization surveys would likely begin within one year following execution of lease (based on the likelihood that a lessee would complete reconnaissance site characterization surveys prior to installing a meteorological buoy). Site characterization surveys would then continue on an intermittent basis for the following 5 years leading up to the preparation and submittal of the COP.
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 transmission cable corridors). The surveys may be completed in phases, with the meteorological buoy areas likely to be surveyed first.
Sub-bottom sampling (CPTs, vibracores, grab samples, SPI) of the WEA would require a sub-bottom 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 transmission cable corridor. Sampling will also be conducted at locations where offshore collector/converter platforms are proposed. 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. Benthic sampling could also include in nearshore, estuarine, and SAV habitats along the transmission cable routes.
Installation, Decommissioning, and Operations and Maintenance Assumptions
Meteorological buoy installation and decommissioning would likely take approximately one day each.
Meteorological buoy installation and decommissioning would likely occur between April and August (due to weather).
Meteorological buoy installation would likely occur in Year 2 after lease execution.
Meteorological 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 meteorological buoy installation, operations and maintenance, and decommissioning.

BOEM = Bureau of Ocean Energy Management; COP = Construction and Operations Plan; CPT = cone penetration test; HRG = high-resolution geophysical; SAV = submerged aquatic vegetation; SPI = sediment profile imaging; WEA = Wind Energy Area.

2.2.1 High-Resolution Geophysical Surveys

High-resolution geophysical (HRG) surveys acquire geophysical shallow hazards information, including information to determine whether shallow hazards will impact seabed support of the turbines, to obtain information pertaining to the presence or absence of archaeological resources, and to conduct bathymetric charting. Side-scan sonars, sub-bottom profilers, magnetometers, and multibeam echosounders may be used during HRG surveys and could add noise to the underwater environment. The types of equipment that may be used during these surveys are described in **Tables 5** and **6**. 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 (Crocker and Fratantonio 2016). Although these representative sources are based on the highest reported power settings and source levels reported, the actual equipment used could have frequencies and source levels below or above 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 5**.

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 WEA to shore using HRG survey methods. BOEM assumes that the HRG 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 to allow for all anticipated physical disturbances and movement of the proposed cable, if necessary.

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

Table 5. 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 EA assumes the use of multibeam 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 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	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; MMS = Marine Minerals Service; WEA = Wind Energy Area.

Table 6. 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	72
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 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.

2.2.2 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 transmission 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 shallow-bottom coring and surface sediment sampling devices 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 7**. These methods may result in bottom disturbance as a result of physical seafloor sampling.

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 transmission 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 7**). 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).

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.

2.2.3 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 surveys, avian and bat surveys, 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 8**. For biological surveys, BOEM assumes that all vessels associated with the Proposed Action would be required to abide by the standard operating conditions (SOCs) (**Section 5**). NMFS may require additional measures from the lessee to comply with the Marine Mammal Protection Act (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 7. 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 will produce 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 2020c)	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; CPT = cone penetration test; dB = decibels; HRG = high-resolution geophysical; MMS = Marine Minerals Service; NMFS = National Marine Fisheries Service; USACE = U.S. Army Corps of Engineers.

Table 8. 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	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 aerial 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

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

2.2.4 Meteorological Buoy Installation

Installation, operation and maintenance, and decommissioning of met buoys for characterizing wind conditions are part of 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 EA assumes that a maximum of two buoys per lease would be installed, thus with 10 leases, a total of 20 buoys are considered. 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** provide evaluations of various met buoy schematics and met buoy and anchor systems, including hull type, height, and anchoring methods. The other 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).

Based on review of the previous lease issuance EAs and the Atlantic Geological and Geophysical (G&G) Final Programmatic Environmental Impact Statement (PEIS) (BOEM 2014a), 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. Anchors for boat-shaped or discus-shaped buoys would weigh about 2,721 to 4,536 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 one day is anticipated for these types of buoys. For spar-type buoys, installation would occur in two phases. Phase one would occur over one 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). 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.

Site clearance activities are also a part of decommissioning obligations and requirements pursuant to 30 CFR §585.906(e) and 30 CFR §585.910(b). 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: a photographic bottom survey, site clearance, or high-resolution side-scan or sector-scanning sonar survey.

IPFs associated with met buoy installation operation and maintenance, and decommissioning (including site clearance) may include vessel traffic, noise and 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.

2.2.5 Non-Routine Events

Reasonably foreseeable non-routine and 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 marine vessels or marine life; (3) spills from collisions or fuel spills resulting from generator refueling; and (4) recovery of lost survey equipment.

Storms, allisions and collisions, and spills have been previously described and analyzed in other relevant EAs (**Table 2**) and impacts. Although these previous documents do not specifically address the NY Bight area, 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 in the NY Bight. 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 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 would 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 is reduced through USCG Navigation Rules and Regulations, safety fairways, and Traffic Separation Schemes (TSSs) for vessels transiting into and out of the ports of NY and New Jersey (NJ). 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 since vessel traffic is controlled by multiple routing measures, such as safety fairways, TSSs, and anchorages. These higher traffic areas were excluded from the WEAs. Risk of allisions with met buoys would be further reduced by USCG-required marking and lighting.

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 due to 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 that 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.

Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills, and most equipment on the met and 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. 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.

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 operations may be performed in a variety of ways depending on the 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.

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), a potential hazard for bottom-tending fishing gear may occur, and additional bottom disturbance may occur. 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 lost survey equipment, BOEM will work with the lessee/operator to develop an emergency response plan. 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 lost survey equipment may include vessel traffic, noise and lighting, air emissions, and routine vessel discharges from a single vessel. Bottom disturbance and habitat degradation may also occur as a result of recovery operations.

2.3 Resources Eliminated from Further Consideration

NEPA requires issues (resource areas) that are significant to the action be the focus of the analysis. Because many of the activities described in this EA have been previously analyzed in the Atlantic G&G Final PEIS, the Alternative Energy PEIS, and other relevant EAs (**Table 2**), the potential for impacts is well documented. The previous analyses provided in **Table 2** address the resources areas listed below in greater detail. Although these previous documents do not specifically address the NY Bight area, the same types of activities described in this EA are addressed in those documents. Additionally, activities included within the Proposed Action of this EA do not include the installation of meteorological towers. Although the results presented in previous EAs had included met tower installation, this potential source of impact has been removed from the present analysis and may account for a different (reduced) impact rating relative to prior assessments. The evaluations and conclusions in those documents are consistent with BOEM's determination that the following resource areas, outlined below, will not be carried forward for analysis in this EA because impacts to those resources are anticipated to be negligible or less.

Bats

The potential impacts on bats associated with site characterization and site assessment activities would be negligible. One species of bat federally listed as threatened, the northern long-eared bat (*Myotis septentrionalis*), occurs on Long Island; its range includes Queens, Nassau, and Suffolk Counties (USFWS 2020). 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 FR 17974). Although migrating tree bats have been detected on the OCS, 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). Impacts to bats are analyzed in detail within the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic OCS Offshore NY, Revised EA (BOEM 2016). The analysis in this EA is consistent with previous determinations in other relevant EAs listed in **Table 2**. As indicated in previous EAs, 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. Bat activity in the Atlantic has been found to decline dramatically 11 nm from shore (Sjollema et al. 2014). Passage of a migrating tree bat through the any of the WEAs is also considered a rare event (BOEM 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 to bats from onshore operational noise and human activity during construction and decommissioning or during survey operations of the export cable route or backbone transmission route in coastal areas; these operations, however, will not be out of character for the areas existing vessel traffic and operations. Overall, the likelihood of collision between bats and boats or met buoys is remote due to both the scarcity of bats offshore and due to the limited amount of added vessel traffic (relative to existing traffic) and number of met buoys to be installed associated with the Proposed Action. To the extent that there would be any impacts to individuals, the overall impact of the Proposed Action on bats would be negligible or less.

Bathymetry, Geology, and Sediments

The potential impacts on bathymetry, geology, and sediments from HRG surveys, geotechnical/benthic sampling, and biological surveys within the NY Bight would be negligible. This is consistent with the analysis of the Atlantic G&G Final PEIS (BOEM 2014a). The installation of a meteorological tower is not included as part of the Proposed Action analyzed within this EA. Installation of a met buoy would result in greater impacts to the seafloor than disturbance from bottom sampling. Disturbance from installation of a met buoy would result in a maximum of 34,398 m^2 with anchor chain sweep per buoy. Assuming the maximum number of met buoys are installed (20), all are either boat-shaped or discus-shaped, and they disturb the maximum foreseeable area of seafloor, a total of 170 ac of seafloor would be affected. 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 decrease the area of impact significantly. 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 sampling range of 1 to 10 m^2 per sample. BOEM estimates that 5,805 samples will be collected (**Appendix A**). The maximum area of disturbance from bottom sampling would be about 14 ac assuming anchoring would be required for all samples and that is a highly unlikely scenario. Additionally, the estimated area of disturbance from bottom sampling would be spread out across the WEAs and along the potential transmission 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 site characterization and site assessment activities would be negligible. The Atlantic coast is a major flyway for birds, including terrestrial species, shorebirds, waterbirds, and marine birds. Five federally listed birds may be found within the WEAs: piping plover (*Charadrius melodus*); red knot (*Calidris canutus rufa*); roseate tern (*Sterna dougallii dougallii*); Bermuda petrel (*Pterodroma cahow*); and black-capped petrel (*Pterodroma hasitata*). 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 Massachusetts and are described in detail within the other relevant EAs listed in **Table 2**. The previous NEPA reviews evaluated impacts to 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, installation of meteorological towers was considered the most significant IPF to birds; that activity has been removed from the Proposed Action for this EA. Relative to existing vessel traffic in the NY Bight, the Proposed Action would introduce a small number of vessels over the timeframe of the Proposed Action, and only a maximum of 20 met buoys would be installed across the five noncontiguous WEAs, resulting in negligible impacts to birds. Additionally, the Proposed Action includes SOCs for birds (**Section 5**) to reduce the potential for the Proposed Action to adversely this resource.

Coastal Habitats

Previous NEPA evaluations include descriptions of the affected environment for coastal habitats along the entire Atlantic Coast including NJ and NY (BOEM 2012; 2016; MMS 2007b). The coastal resources of the NY and NJ 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 to SAV beds are addressed in **Sections 4.2.1** and **4.2.3**. The closest WEAs are located approximately 15 nm from NY and 23 nm from NJ. 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 split between ports in NY and NJ, 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 EAs (**Table 2**) and are not discussed further because these activities would be the same, with the exception that meteorological towers will not be installed as part of the Proposed Action within this EA. Existing commercial ports, harbors, or industrial areas composing the coastal infrastructure could be used when implementing the Proposed Action, such as Staten Island, Brooklyn, and Eerie Basin in NY or Perth Amboy, Shark River, and Newark in NJ.

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**), 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 other relevant EA documents and the Atlantic G&G Final PEIS (**Table 2**); it was concluded that impacts from these activities were expected to be negligible. Although the previous analyses do not cover the same geographic region, the types of activities addressed would have similar impacts on demographics and employment in the NY and NJ coastal areas. Temporary increases in employment from Proposed Action activities, such as surveying and met buoy fabrication and installation, could occur in various local economies associated with onshore- and offshore-related industry in the coastal counties of NY and NJ. Additionally, the small number of workers directly employed in site characterization and site assessment surveys would be insufficient to have a perceptible impact on local employment and population.

BOEM expects any beneficial impacts on employment, population, and the local economies in and around the ports to be short term and imperceptible, depending on the distribution of activities among ports and over time; therefore, impacts would be negligible. Although the approximate number of workers directly employed would be measurable, benefits to the local economy would be difficult to measure, and the overall impact to the local economy would be difficult to determine; therefore, impacts to demographics and employment would be nominal.

Environmental Justice

The anticipated leases would be located 15 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 has the potential to impact minority or low-income populations. However, existing coastal facilities in NY and NJ (ports and harbors) 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 NY Bight. 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 to 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 in **Bathymetry, Geology, and Sediments** above. No impacts are anticipated to 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 NJ and NY (BOEM 2012; 2016; MMS 2007b). The potential impacts on visual resources associated with site characterization and site assessment activities would be negligible. Impacts to visual resources are analyzed in detail within the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic OCS Offshore NY, Revised EA (BOEM 2016). Previous determinations in other relevant EAs listed in **Table 2** focus on impacts from the installation of meteorological towers, which will not occur under the Proposed Action analyzed in this EA. The WEAs vary from 23 to 69 nm off the coast of NJ and from 15 to 45 nm off the coast of NY, and 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 to 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 to coastal and marine waters from vessel discharges should be of short duration and remain minimal, if detectable, with adherence to regulations governing discharges (BOEM 2016). The Proposed Action is not anticipated to increase runoff or onshore discharge into harbors, waterways, coastal areas, or the ocean environment. Most site characterization and site assessment activities would be covered by U.S. Army Corps of Engineers (USACE) Nationwide Permit (NWP) Numbers 5 and 6, which were developed under Section 404 of the Clean Water Act and Section 10 of the River and Harbors Act to provide a streamlined evaluation and approval process for certain activities that have minimal adverse impact, both individually and collectively, on the environment. NWP 5 covers the placement of scientific measurement devices, including tide gages, water recording devices, water quality testing and improvement devices, meteorological stations, and similar structures. NWP 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. 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 to any area within the WEAs or along any potential transmission cable route.

Impacts to water quality could occur during met buoy installation and decommissioning, with water quality returning to its original state rapidly during operation of the buoys and after decommissioning without mitigation. 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 not out of character for the region. Therefore, impacts from vessel discharges, sediment disturbance from geotechnical/benthic sampling and met buoy installation/decommissioning, and recovery of lost equipment in coastal and marine water quality would be negligible or less, with any changes being small in magnitude, highly localized, and transient.

3 Alternatives and Geographic Analysis Area

This chapter describes one action alternative and the No Action Alternative for lease and grant issuance, site characterization, and site assessment activities within the WEAs and along the transmission cable corridors of the NY Bight. The alternatives are described in **Table 9** and the following sections.

Table 9. Alternatives analyzed in detail

Alternative	Description
Alternative A – No Action	Under Alternative A, no leases or grants would be issued in the NY Bight at this time. Site characterization 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 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, between the WEAs, and shore along the potential transmission cable corridors.

WEA = Wind Energy Area

Alternative B was developed as a result of extensive coordination with the NY Bight Intergovernmental Renewable Energy Task Force (BOEM 2021a); 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 2021a).

3.1 Alternative A – No Action

Under the No Action Alternative, no wind energy leases would be issued, and site assessment activities would not occur within the identified WEAs of the NY Bight. Although site characterization surveys do not require BOEM approval and could still be conducted under Alternative A, these activities would not be likely to occur without a commercial wind energy lease. Alternative A will serve as the shifting baseline (changes over time) against which action alternatives are evaluated.

3.2 Alternative B – Proposed Action/Preferred Alternative

Alternative B (the Preferred Alternative or Proposed Action) is the issuance of up to 10 commercial and research wind energy leases and site characterization and site assessment activities within the WEAs as identified in **Figure 1**, and the granting of ROWs and RUEs in support of wind energy development.

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 their WEAs. 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. Additionally, BOEM anticipates that each lease could have up to two transmission cable routes (for connecting future wind turbines to an onshore power substation) or would utilize a backbone transmission system.

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 SOCs (**Section 5**) and would be implemented through lease stipulations. The impacts of Alternative B on environmental and socioeconomic resources are described in detail in **Section 4.3**.

3.3 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 NY Bight WEAs (e.g., water quality). This includes potential activities that would occur on the Atlantic OCS offshore NY and NJ as well as activities that would take place in state waters (the NY Bight area) (**Figure 1**). However, the geographic boundaries for the analysis for marine mammals, sea turtles, fish/fishing, and birds include the entire NY Bight and some waters offshore Rhode Island (RI) and Massachusetts to the north and Delaware to the south given their highly mobile and, in some cases, migratory nature (**Appendix D, Figure D-1**). 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 southwestern corner of the Hudson South WEA to Cape May, NJ, and as far north as a line drawn between the northeastern corner of the Fairways North WEA to the eastern edge of Narragansett Bay. 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 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 analysis area.

Figure 2 provides a diagram depicting the present (ongoing) and planned actions that serve as the shifting baseline within the geographic analysis area, while **Figure 3** provides a diagram depicting the Proposed Action in addition to the shifting baseline within the geographic analysis area.

3.4 Alternatives Considered but Dismissed

The proposed 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, exiting cable, recreational and commercial fishing, and vessel navigation (**Section 6.1.1**). On March 29, 2021, BOEM released the Area ID Memorandum (BOEM 2021a), which documents the analysis and rationale used to develop recommendations for WEAs in the NY Bight. 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 to the various resources analyzed in this draft EA.

BOEM considered including as a second action alternative a temporal removal of portions of the WEAs, and NMFS proposed a similar mitigation alternative in their scoping comment letter. After further evaluation, it became apparent that lease stipulations and SOCs would regulate the mitigative seasonal restrictions, and these alternatives were dismissed from further consideration. Other scoping comments did not suggest alternatives that met the purpose and need and/or would have resulted in different impacts.

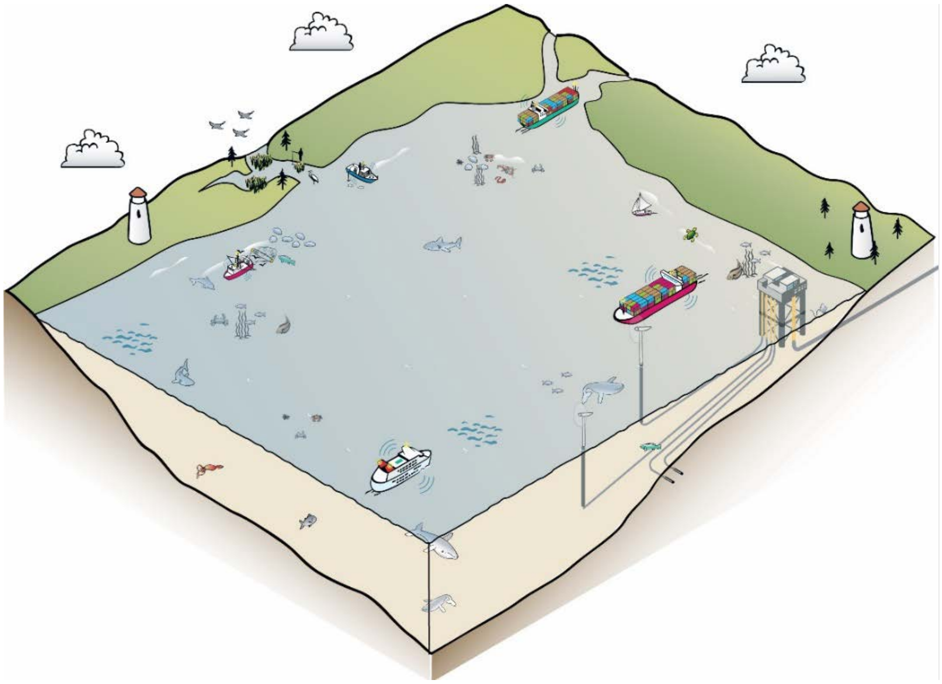

Figure 2. Diagram representing the No Action Alternative and affected environment (including planned actions)

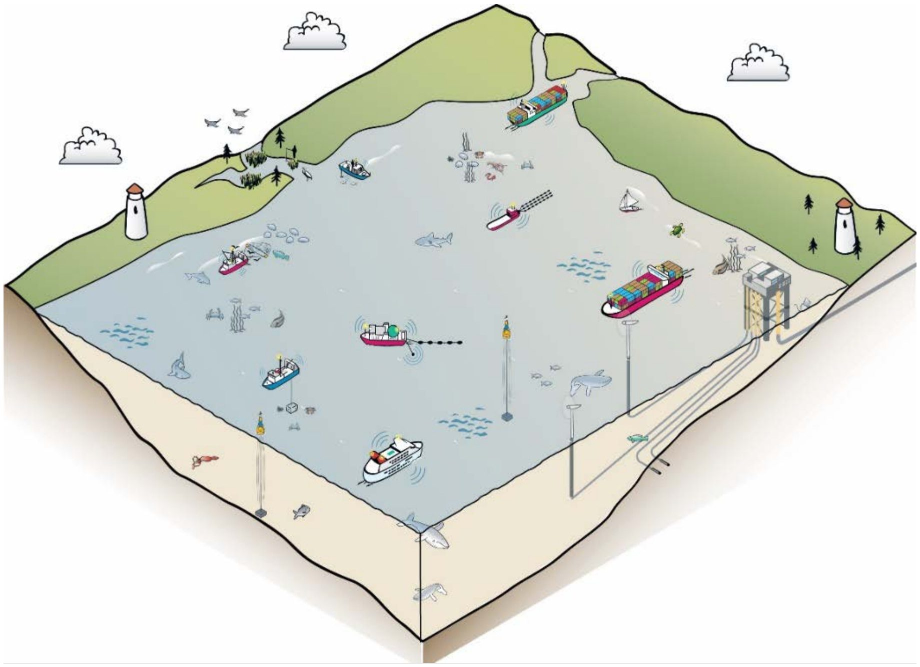

Figure 3. Diagram representing the Proposed Action/Preferred Alternative when added to the baseline

4 Environmental Consequences

4.1 Assessment Methodology

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: biological and physical, and socioeconomic resources. Impact level definitions used in this EA are described in **Table 10**.

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

Table 10. Definitions of impact determinations used in this environmental assessment

Impact Determination	Definition for Biological and Physical Resources	Definition for Socioeconomic Resources
Negligible	No measurable impacts.	No measurable impacts.
Minor	Most impacts on the affected resource could be avoided with proper 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 proper mitigation. Impacts would not disrupt the normal or routine functions of the affected activity or community. Once the impacting agent is eliminated, the affected activity or community would return to a condition with no measurable effects without any mitigation.
Moderate	Impacts on the affected resource are unavoidable. Proper 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 proper mitigation is applied during the life of the Proposed Action or proper remedial action is taken once the impacting agent is eliminated.	Impacts on the affected activity or community are unavoidable. Proper 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 proper remedial action is taken.
Major	Impacts on the affected resource are unavoidable. Proper 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 proper 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. Proper 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 Section 1501.5 of the Council on Environmental Quality (CEQ) implementing regulations, BOEM has focused the main body of the EA on the impacts for resources of most concern and moved the analysis of other resources, including all resources consisting of only negligible Proposed Action impacts, to **Appendix B**, including air quality (emissions estimates are presented in **Appendix C**); cultural, historical, and archaeological resources; and recreation and tourism.

4.2 Alternative A – No Action Alternative and Affected Environment

Under the No Action Alternative, BOEM would not issue commercial wind energy leases, and grants and site assessment activities would not occur in the WEAs included in the Proposed Action. This would eliminate vessel traffic associated with site assessment (installation, maintenance, and decommissioning of met buoys). Site characterization surveys do not require BOEM approval and could still be conducted under the No Action Alternative; however, a potential lessee is not likely to undertake these activities without the possibility of securing a commercial wind energy lease. This section is a description of how the affected environment for each resource may change or evolve (i.e., the trajectory of the resource) absent the Proposed Action (Alternative B). Other present (ongoing) and planned actions that contribute to the No Action baseline will be addressed, along with impacts to the resources from those actions with a focus on effects that are reasonably foreseeable and have a reasonably close causal relationship to the Proposed Action in the same location and timeframe (5 to 7 years after first lease issuance).

Appendix D includes a list of the projects and 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 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.

BOEM has completed a study of IPFs on the North Atlantic OCS to consider in an offshore wind development cumulative impacts scenario[2] (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.

[2] On July 16, 2020, the CEQ, which is responsible for Federal agency implementation of NEPA, updated the regulations for implementing the procedural provisions of NEPA (85 FR 43304–43376). The new implementing regulations went into effect on September 14, 2020. The update eliminated explicit references to “cumulative impacts” from the regulations. Instead, “the environmental impact statement shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration, including the reasonably foreseeable environmental trends and planned actions in the area(s).” As such, the term “cumulative” has been replaced by planned actions throughout this EA.

The Avanti Corporation and Industrial Economics Inc. (2019) study identifies the relationships between IPFs associated with specific ongoing and reasonably foreseeable "planned actions" and activities in the North Atlantic OCS to consider in a NEPA "planned actions" impacts scenario. These IPFs and their relationships were utilized in the EA analysis and identification of "planned actions" impacts, and the application as to which IPF applied to which resource was decided by BOEM. If an IPF was not associated with the Proposed Action, it was not included in this analysis.

As discussed in the Avanti Corporation and Industrial Economics Inc. (2019) study, "planned actions" other than offshore wind projects may also affect the same resources as the Proposed Action or other offshore wind projects, possibly via the same IPFs or via IPFs through which offshore wind projects do not contribute. This section describes different resources and describes how these reasonably foreseeable planned actions would affect each of those resources in the absence of the Proposed Action.

4.2.1 Benthic Resources

Descriptions of the benthic resources offshore NY are provided in a previous EA (BOEM 2016) and resources offshore NJ are described in the lease issuance EA for NJ, Delaware, Maryland and Virginia (BOEM 2012) and the Ocean/Wind Power Ecological Baseline Studies Final Report (Geo-Marine Inc. 2010) and are incorporated by reference.

The NYSERDA published results of a multibeam echosounder and benthic survey on the NY Bight in 2017 (NYSERDA 2017a). The following conclusions were drawn based on the results from the 2017 survey, with other findings incorporated by reference:

- Multibeam echosounder data indicated that the most prevalent bedforms observed across the survey area were sand waves, sand bars, and ripples formed in response to hydrodynamic forcing at multiple scales.
- Surface sediments were generally firm, fine, and medium sands, although very fine silty sand and gravel to slightly gravelly sediments were also observed.
- Data collected from Sediment Profile Image and Plan View photographic images indicated that the areas surveyed were composed of soft-bottom substrata that were predominantly firm sands and occupied by diverse benthic biotic communities.
- The primary biotic community in the lease area was *Echinocardium* bed, as sand dollars were observed at most survey stations.
- No sensitive habitats (such as cold-water corals) were observed.

In addition to sand dollars, infauna, and mobile epifauna associated with soft sediments (such as crabs, gastropods, bivalves, burrowing anemones, and sea stars) were observed throughout the study area. In softer fine and very fine sand, infaunal tube-building and burrowing polychaetes, as well as orange sponges and abundant beds of thin *Ampelisca* amphipod tubes, were observed.

The inner 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 (Williams et al. 2007). 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 4.2.3** for additional information). **Section 4.2.3** also includes a discussion of impacts to 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; Geo-Marine Inc. 2010).

Artificial reefs are man-made underwater structures that are developed intentionally or from remnants of objects built for other purposes, such as shipwrecks. The NY State Department of Environmental Conservation manages 12 artificial reefs in the marine district relatively close to shore and outside of the WEAs (New York State Department of Environmental Conservation 2021). The State of NJ has an artificial reef network containing 17 artificial reef sites—located between 2 and 25 nm offshore from Sandy Hook to Cape May—that it manages in cooperation with the USACE (NJDEP 2019).

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 a Habitat Areas of Particular Concern (HAPCs) for both juvenile and adult summer flounder (also known as fluke) (**Sections 4.2.3** and **4.3.3**).

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. Additional activities that disturb benthic resources include dredging for navigation and military uses. Disturbance of benthic invertebrate communities by commercial fishing activities can impact community structure and diversity and limit recovery, although 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 will impact benthic resources.

Conclusion

Although leases would not be issued under the No Action Alternative, BOEM expects ongoing activities and planned actions to have continuing regional impacts on benthic resources over the timeframe considered in this EA (**Appendix D**).

Over the timeframe considered in this EA, local impacts to benthic resources from climate change are likely to be small, incremental, and difficult to discern from effects of other actions such as commercial fishing. 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 offshore wind structures could attract some fish species resulting in increased predation on benthic resources and recreational and commercial fishing efforts could increase nearby as well. The dominant habitat type in the region is sand or soft bottom, and these structures could create new hard surfaces that may provide habitat for hardbottom species like blue mussel and sea anemones.

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 to benthic resources because though the viability of the resource is not threatened, some impacts may be irreversible.

4.2.2 Commercial and Recreational Fishing

BOEM (2016) examined the fishing grounds and corresponding revenue within the NY Bight area. Information from this report is incorporated here by reference. Multiple fishing grounds are located within the NY Bight, including Cholera Bank, Middle Ground Bank, and Angler Bank. This diversity of fisheries results in a variety of vessels, gear types, and fishing techniques being used in the WEAs (BOEM 2021a; NYSERDA 2017b).

Fisheries in the geographic analysis area are managed at both the Federal 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 15 Atlantic states form the Atlantic States Marine Fisheries Commission. Species managed at the Federal level include sea scallop, Atlantic salmon, 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 level.

NOAA Fisheries maintains landings data for commercial and recreational fisheries based on year, state, and species. Fisheries that utilize the NY Bight to the greatest extent include the Atlantic sea scallop, squid, summer flounder, and surfclam/ocean quahog fisheries. See **Figures 4**, **5**, **6**, and **7** for spatial distributions of sea scallop revenue; squid, mackerel, and butterfish revenue; summer flounder, scup, and black sea bass revenue; and surfclam/ocean quahog revenue within the analysis area for 2018. The sea scallop fishery accounts for approximately 37% of the total fishing revenue in the analysis area (NOAA Fisheries 2019). Additional fisheries include menhaden, American lobster, Atlantic surfclam, and ocean quahog. See **Table 11** for a summary of the 2019 commercial revenue and landings for the top ten species by revenue for NY, NJ, and RI.

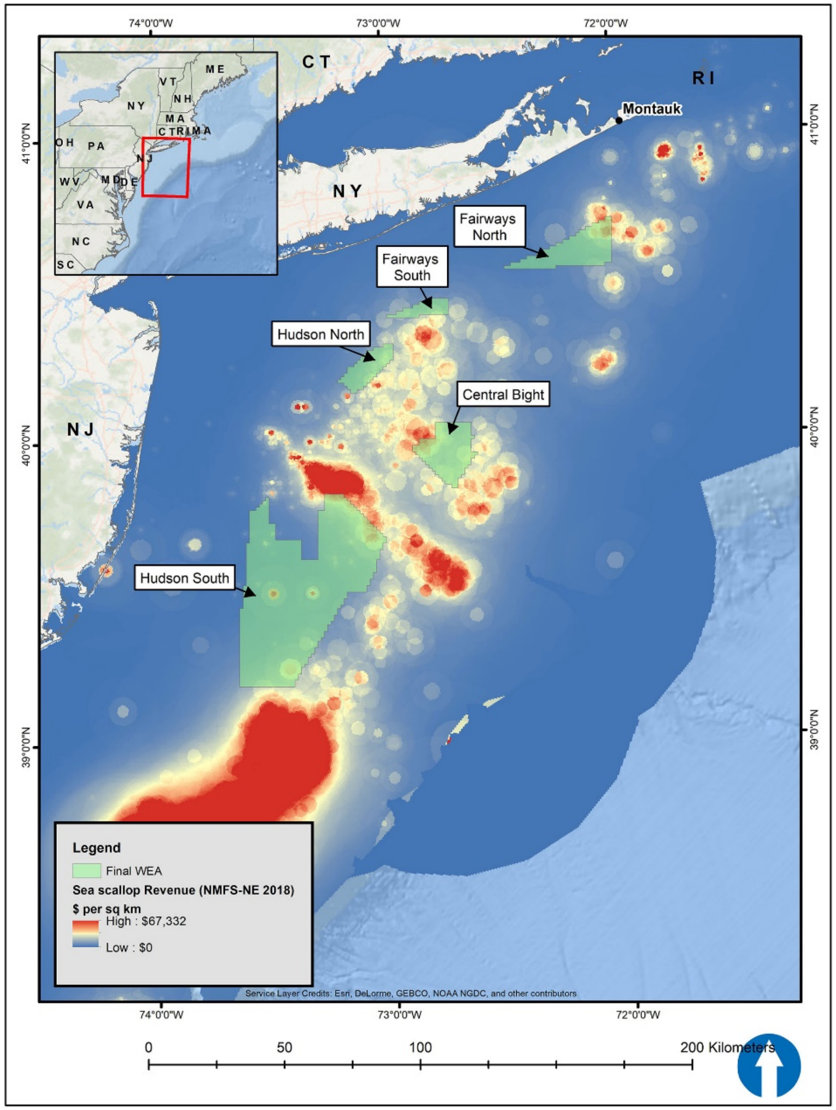

Figure 4. Sea scallop revenue from 2018 data in the NY Bight Wind Energy Areas (WEAs) (NOAA Fisheries 2019)

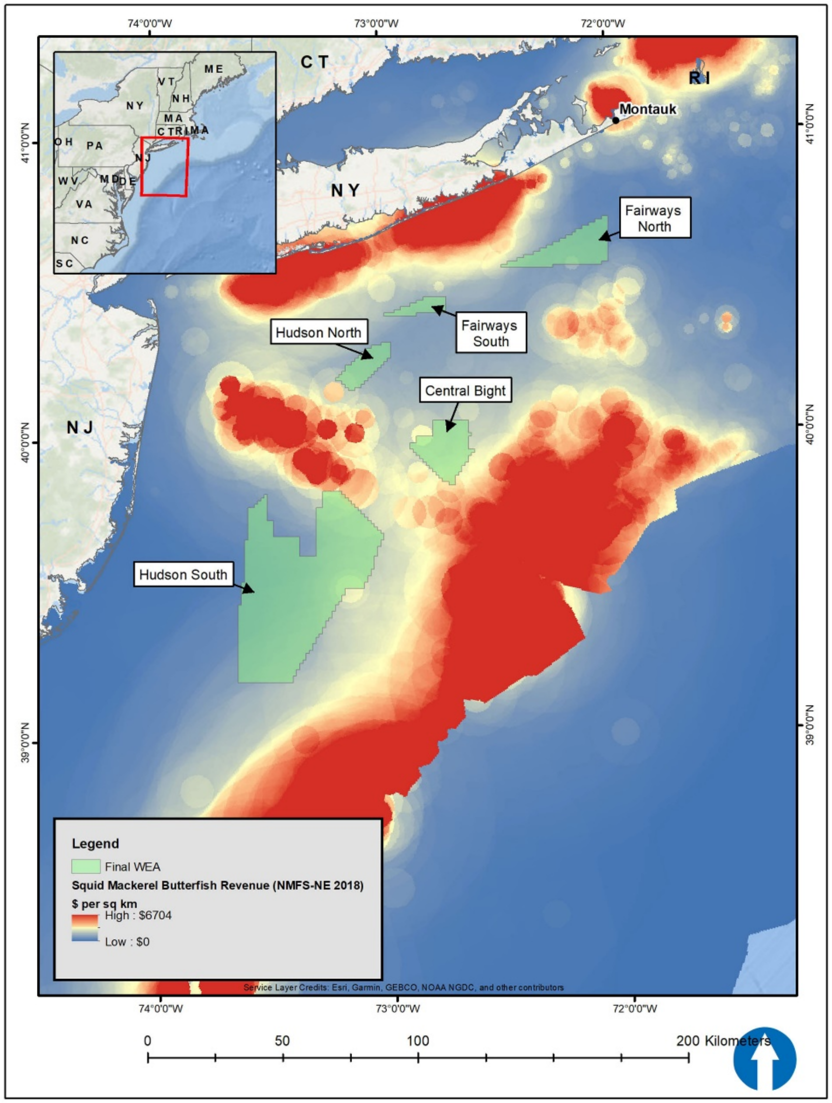

Figure 5. Squid, mackerel, and butterfish revenue from 2018 data in the NY Bight Wind Energy Areas (WEAs) (NOAA Fisheries 2019)

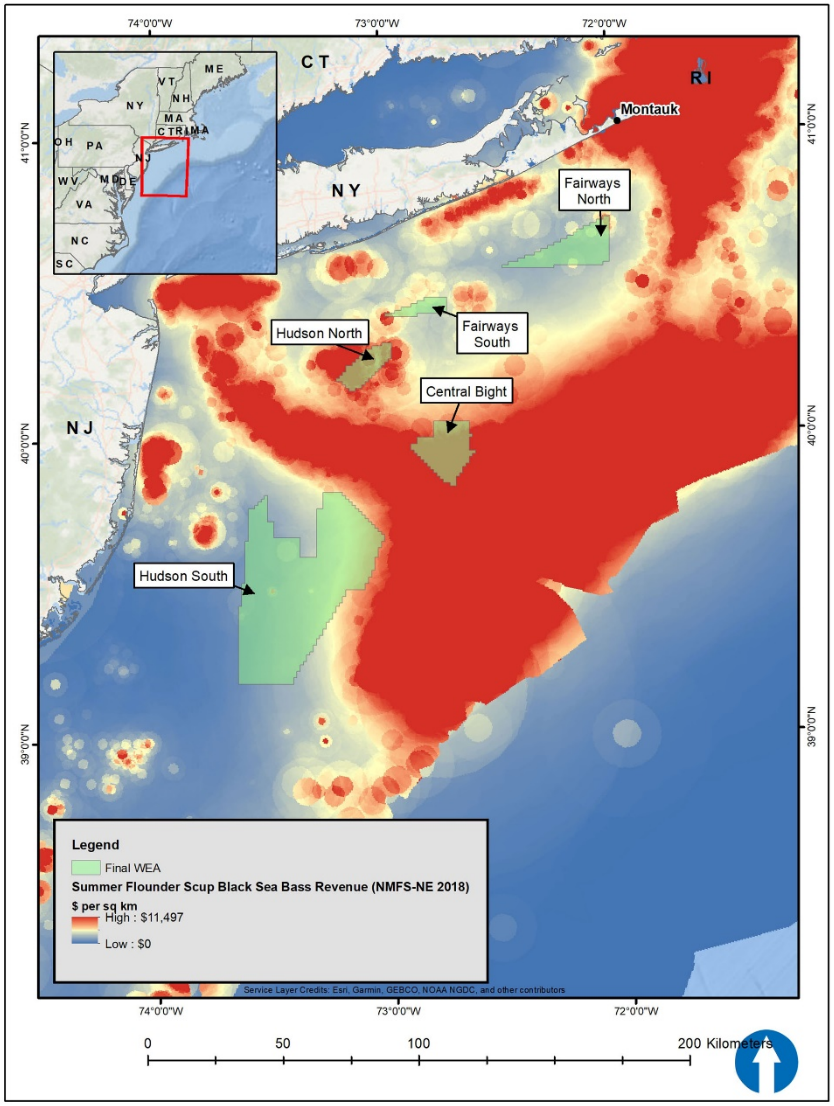

Figure 6. Summer flounder, scup, and black sea bass revenue from 2018 data in the NY Bight Wind Energy Areas (WEAs) (NOAA Fisheries 2019)

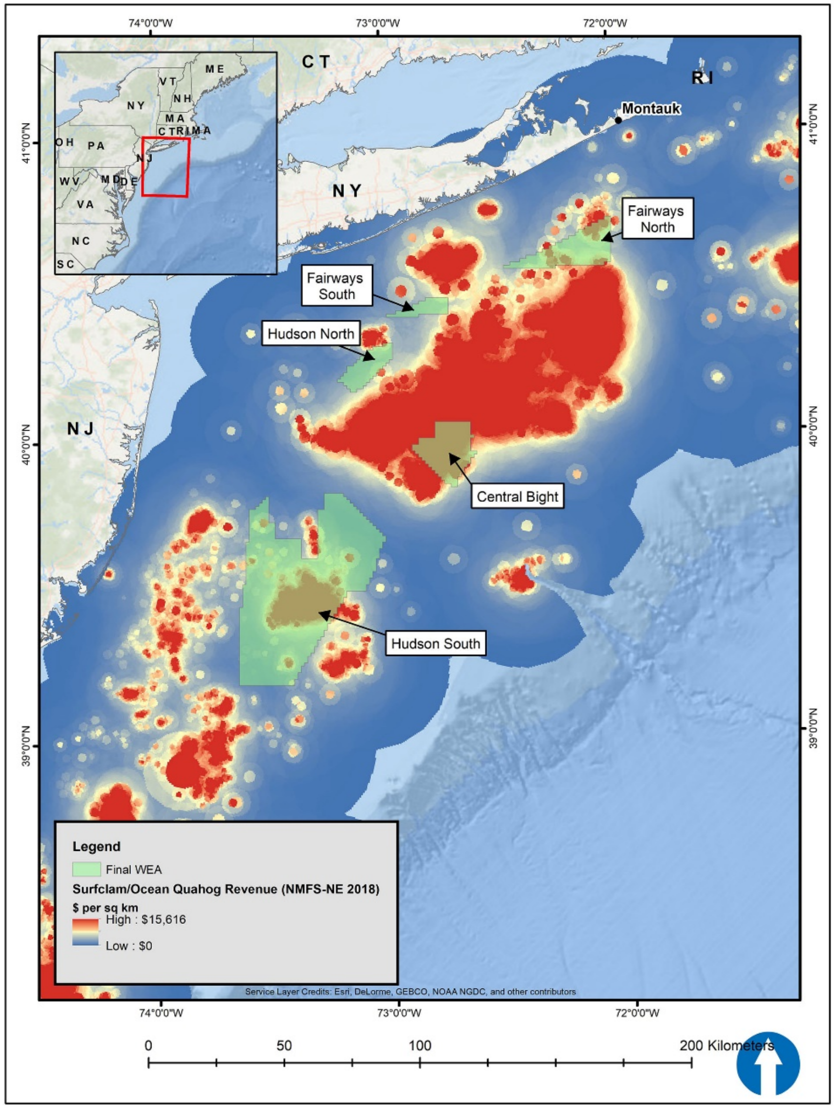

Figure 7. Surfclam/ocean quahog revenue from 2018 data in the NY Bight Wind Energy Areas (WEAs) (NOAA Fisheries 2019)

Table 11. Commercial revenue and landings summary for 2018 for the top ten species by revenue for New York, New Jersey, and Rhode Island

Species Name	Pounds	Dollars
Sea scallop	13,280,756	121,900,348
Longfin squid	22,213,210	34,132,115
Shortfin squid	40,289,416	20,115,696
Summer flounder	4,126,157	14,198,848
Menhaden	79,015,909	13,625,105
American lobster	2,189,937	13,368,482
Atlantic surfclam	18,622,741	12,613,263
Ocean quahog	1,999,445	11,455,040
Blue crab	5,768,085	8,719,851
Eastern oyster	486,838	7,148,953
Other	89,243,822	73,114,371

Source: NOAA Fisheries (2019)

There are multiple recreational areas within the NY Bight, particularly around Cholera Bank and along the south coast of Long Island. The State of NJ designated Cholera Bank as a sport and commercial fishing ground, and as a prime fishing habitat (Long and Figley 1984). As noted in BOEM (2016), five aliquots on Cholera Bank were previously removed from leasing consideration. The fisheries with the highest landings in 2019 were striped bass, scup, and summer flounder (NOAA Fisheries 2019). See **Table 12** for a summary of the 2019 recreational landings for NY, NJ, and RI.

Table 12. Recreational landings summary for 2018 for New York, New Jersey, and Rhode Island

Species Name	Pounds
Striped bass	16,046,409
Scup	9,946,276
Summer flounder	6,507,968
Bluefish	6,113,698
Black sea bass	5,469,250
Tautog	4,847,883
Bluefin tuna	3,415,843
Thresher shark	2,884,628
Atlantic herring	1,493,666
Dolphinfish	1,177,292
Other	6,903,883

Source: NOAA Fisheries (2019)

For more information, see **Section 4.2.3**, and see **Appendix E** for the EFH Assessment. Additional details are also located in the Draft Environmental Impact Statement issued for the Liberty Port Ambrose Deepwater Port Application (Tetra Tech Inc. 2013) and in the Memorandum for Area ID in the NY Bight (BOEM 2021a).

Generally, the activity and value of fisheries are expected to remain fairly stable during the time frame of considered in this EA. Commercial fisheries and recreational fishing in the NY Bight 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) and may impact commercial and recreational fisheries differently; habitat may increase for some stocks, and decrease for others, depending on the targeted species and the 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

Although leases would not be issued under the No Action Alternative, 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**).

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. These impacts may arise from met buoys, foundations, scour/cable protection, and transmission cable infrastructure.

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 have to adjust somewhat to account for disruptions and space-use conflicts due to impacts.

4.2.3 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 soft-bottom demersal fishes, pelagic fishes (i.e., coastal pelagic, epipelagic, and mesopelagic fishes), and ichthyoplankton are discussed in the Atlantic G&G Final PEIS (BOEM 2014a). Finfish occurring in the NY Bight are also described in the previous NY EA (BOEM 2016). Many of the fish species found in the NY Bight are of importance due to their value as commercial and/or recreational fisheries (**Section 4.2.2**). Fish species from the Mid-Atlantic Bight listed under the ESA by NOAA Fisheries as endangered are Atlantic salmon, shortnose sturgeon, and the NY Bight distinct population segment of Atlantic sturgeon. Two additional Mid-Atlantic Bight species, giant manta and oceanic whitetip shark, are listed as threatened under the ESA. More information on these ESA-listed species may be found in the biological assessment (Anderson 2021; Baker and Howson 2021).

Several managed invertebrate species occur in the NY Bight and are known to occur or could occur in the WEA, including longfin inshore squid, Atlantic sea scallop, Atlantic surfclam, ocean quahog, horseshoe crabs, blue crab, and American lobster. Several invertebrates such as shrimps, crabs, amphipods, gastropods, and polychaete worms are not managed but contribute to food webs from offshore or nearshore ecosystems (Malek et al. 2016).

EFH for fish and shellfish resources of NY Bight WEAs was characterized using broad ecological/habitat categories: soft bottom, hard bottom, 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. HAPC (**Figure 8**) offshore of NJ and NY include Baltimore, Wilmington, Toms, Middle Toms, Hendrickson, and Hudson Canyons. Other HAPCs include sand tiger shark pupping area in Delaware Bay; sandbar shark nursery areas in Great Bay, NJ; inshore juvenile cod (< 20 m depths); and summer flounder SAV nursery areas. HAPC for summer flounder includes 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 (NMFS 2021).

Estuarine (inshore) portions of the analysis area are characterized mostly by sedimentary, soft bottom but also 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 present in inshore waters include squids, scup, weakfish, bluefish, summer flounder, and winter 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).

Finfish, invertebrates, and EFH in the NY Bight 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 U.S. northeast fishery species (Hare et al. 2016); some stocks may increase 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, disturbs seafloor habitat on a recurring basis. 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. Dredging disturbs swaths of seafloor habitat. Impacts from the aforementioned activities are similar in nature but much greater in extent (spatially and temporally) than those caused by other bottom-directed IPFs such as pipeline trenching or submarine cable emplacement that create a relatively narrow trench and backfill in the same operation.

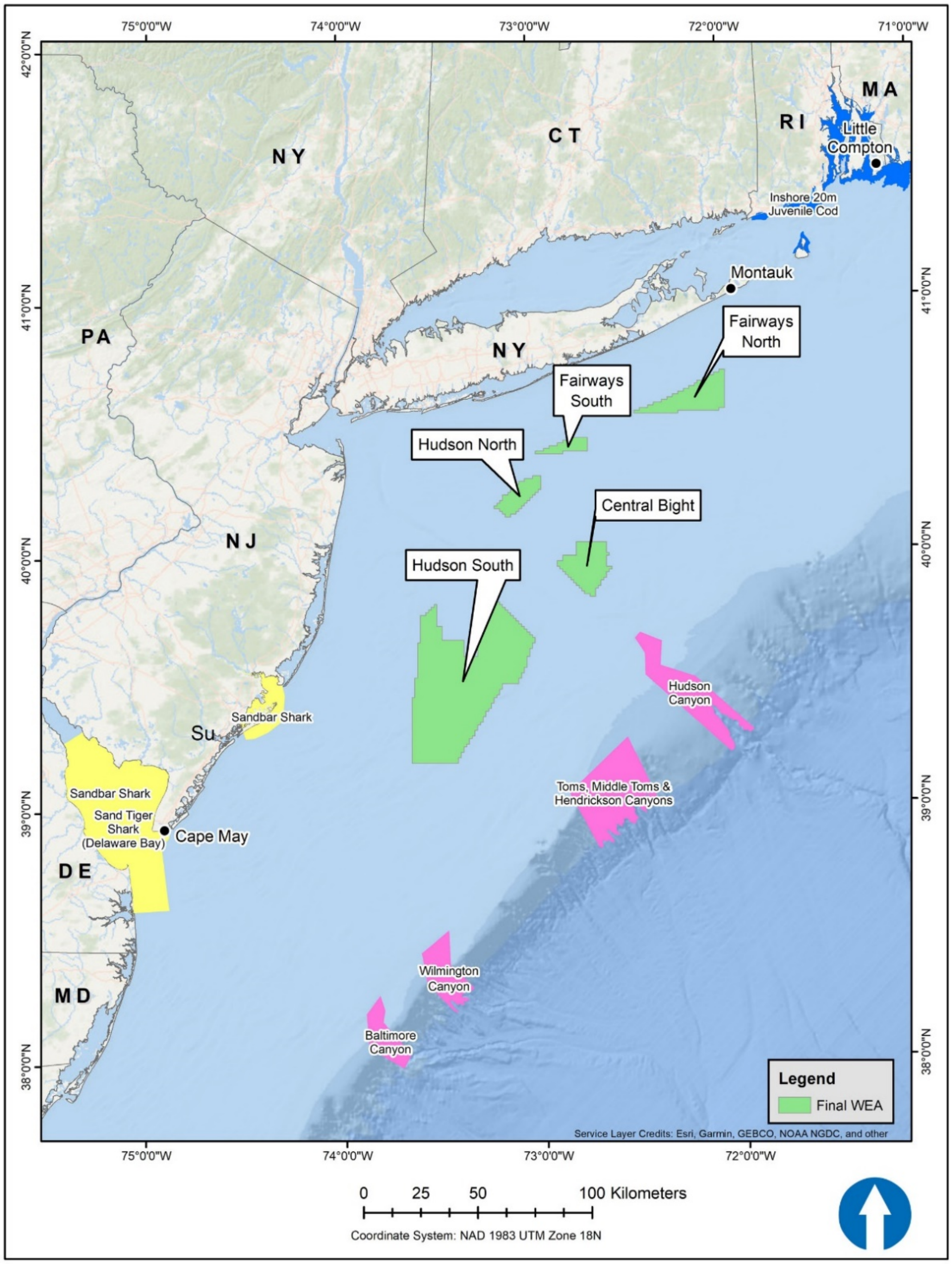

Figure 8. Habitat Areas of Particular Concern (HAPCs) in the vicinity of the NY Bight Wind Energy Areas (WEAs)

Source: NMFS (2021). Note that the summer flounder HAPC is not shown as the data is not currently available

Conclusion

Although leases would not be issued under the No Action Alternative, 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 to 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 stem 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 listed in **Table 2**). Noise generated during pile driving in adjacent leases can be transmitted through water and/or through the seabed, and 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 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. Wind energy structures in the geographic analysis area also may have potential effects on the Mid-Atlantic Bight Cold Pool (BOEM 2021b; 2021c). BOEM does not anticipate that planned offshore wind structures would negatively affect the Cold Pool, although they could affect local conditions.

As discussed in **Section 4.2.1**, 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 soft bottom, and these structures would create new hard surfaces that may provide habitat for benthic resources, generating some beneficial impacts on local ecosystems. Furthermore, impacts to ESA-listed species and their habitat could occur from these planned actions.

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 to finfish, invertebrates, and EFH because the overall effect would be unavoidable, but the resource would be expected to recover completely.

4.2.4 Marine Mammals

There are 31 species of marine mammals that occur on the NY Bight consisting of 6 mysticete (baleen whales) taxa, 21 odontocete species (toothed whales including dolphins, a porpoise, beaked whales, dwarf and pygmy sperm whales, and sperm whales), and 4 pinniped (seals) taxa. 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, five marine mammal species are additionally protected under the ESA. These species are listed as endangered and include the blue whale, fin whale, North Atlantic right whale (NARW), sei whale, and sperm whale. The blue whale, sei whale, and sperm whale are primarily found in deeper waters seaward of the WEAs, while NARWs and fin whales are considered to be seasonally "common" in the WEAs. Perhaps the most biologically important marine mammal found in the region is the NARW, as estimates indicate there are fewer than 400 individuals currently alive in waters from offshore Newfoundland to the southeast U.S. Pettis et al. (2021) derive their estimates from historically and emerging high-use habitats and migratory corridors across the region. All coastal waters from Massachusetts to Florida have been identified as a biologically important area for this species, essential for their seasonal migration. Additionally, the area east of Montauk Point has been designated as a biologically important feeding area for the endangered fin whale (LaBrecque et al. 2015). There is no critical habitat for any endangered and threatened species in the NY Bight.

There are several relevant reports specific to offshore energy planning and the occurrence of marine mammals and/or sea turtles in the NY Bight on the following topics: marine mammal and sea turtle distribution off Long Island, NY; NARW occurrence off NJ from visual and acoustic surveys; cetacean and sea turtle distribution in the NY offshore planning area; baseline monitoring for large whales in the NY offshore planning area; and distribution and habitat use for the six cetacean species of the greatest conservation need (Kenney and Vigness-Raposa 2010; Lagueux et al. 2010; New York Department of State [NYDOS] 2013; New York State Department of Environmental Conservation 2015; Schlesinger and Bonacci 2014; Whitt et al. 2013). Furthermore, more information regarding abundance estimates, life history, hearing abilities, and foraging behavior can be found in Mangi Environmental Group (2011), BOEM (2014a), and Waring et al. (2016).

The *U.S. Atlantic and Gulf of Mexico Draft Marine Mammal Stock Assessment 2020* (Hayes et al. 2021) indicated that for most marine mammal species found regularly in the NY Bight, 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 are significantly below what was expected, 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[3] (Hayes et al. 2021).

Marine mammals in the geographic analysis area are subject to a variety of ongoing human-caused impacts that overlap with the Proposed Action, including collisions 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, as outlined in BOEM (2019c).

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). Entanglement in fishing gear and vessel

[3] NMFS defines a strategic marine mammal stock as a declining stock that is experiencing a high level of human-caused mortality and is likely to be listed under the ESA or designated as depleted under the MMPA.

strikes have been identified as the leading causes of mortality in NARWs and may be a limiting factor in the species recovery (NOAA Fisheries 2021a). Entanglement may also be responsible for high mortality rates in other large whale species (Hayes et al. 2021; Read et al. 2006). Additionally, bottom trawling and benthic disruption have the potential to result in impacts on prey availability and distribution.

Conclusion

Although leases would not be issued under the No Action Alternative, 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 to 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 moderate potential to affect marine mammals. These effects range from low-level behavioral effects to temporary hearing impairment (Wood et al. 2012). Permanent sublethal hearing injuries, although possible, are unlikely to occur based on current and anticipated future impact avoidance and minimization requirements. 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. 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.

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 as well presenting entanglement risks to marine mammal species. These structures may also displace marine mammals from preferred habitats or alter movement patterns, potentially changing exposure to commercial and recreational fishing activity. 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.

Considering all the IPFs together, BOEM anticipates that the overall impacts associated with reasonably foreseeable planned actions in the geographic analysis area may result in **moderate** adverse impacts to marine mammals because the overall effect would be unavoidable, as some individuals will likely experience disturbances, but the affected individuals would be expected to recover completely.

4.2.5 Military Use and Navigation/Vessel Traffic

As described in BOEM (2016) and Tetra Tech Inc. (2013), multiple military installations are located along the NY and NJ coastlines, operated by the U.S. Navy, U.S. Army, U.S. Air Force, and USCG. Vessels and aircraft conducting military operations are typically working in military operating areas (OPAREAs) away from commercial traffic lanes. These operations could include submarine and anti-submarine training, U.S. Air Force exercises, and various vessel training exercises. The USCG also has two Weapons Training Areas located offshore of NY for training in law enforcement operations. According to the Marine Cadastre National Viewer, there is a Danger Zone located east of Sandy Hook, NJ, and one at the Cape May inlet in Cape May, NJ. There is also a Restricted Area associated with the U.S. Navy Operational Support Center in Earle, NJ.

The NY Bight is an important economic area on the Atlantic Coast supporting commercial shipping at the Port of NY and NJ. There are three TSSs established by the International Maritime Organization (IMO) and under the jurisdiction of the USACE. Moving from north to south, the three TSSs are the Nantucket to Ambrose/Ambrose to Nantucket Traffic Lanes, Hudson Canyon to Ambrose/Ambrose to Hudson Canyon Traffic Lanes, and the Barnegat to Ambrose/Ambrose to Barnegat Traffic Lanes. Each TSS is surrounded by precautionary areas at its inshore and offshore limits (**Figure 9**). According to a 2016 economic study by the Port Authority of NY and NJ, the Port handled 8,500 deep sea vessel transits during 2016 (Port Authority of NY & NJ 2017). According to 2019 Trade Statistics reported by the Port Authority of NY and NJ, the Port handled a total of 86,215 thousands of metric tons of cargo (bulk and general) during 2019 (Port Authority of NY & NJ 2021).

In addition to commercial shipping, the Port of NY and NJ contains three cruise terminals located in Manhattan and Brooklyn, NY, and Bayonne, NJ. There are also multiple ferry terminals that operate in NY Harbor, with some service locations in Central NJ, Connecticut, and Massachusetts.

In June 2020, the USCG published an Advanced Notice of Proposed Rulemaking for the Atlantic Coast. The Notice included new shipping safety fairways in the vicinity of the WEAs and described in the Atlantic Coast Port Access Route Study (PARS). The Notice also included a tug and towing lane within the NY Bight as shown in **Figure 9**. Additionally, the USCG published two notices to conduct PARSs for the coast of NJ and the northern NY Bight. In April 2021, the USCG published a supplemental notice of study concerning the Northern NY Bight PARS. The USCG requested additional sources of information to assess the various uses in the study area (i.e., fishing activity, boating traffic, military activities, and environmental information) and any other general comments. The USCG will use this data to evaluate the potential of revising the lanes as depicted in the Advanced Notice of Proposed Rulemaking.

The Memorandum for Area ID in the NY Bight discusses the meetings BOEM has conducted and actions BOEM has taken in an attempt to remove portions of the WEAs and effectively deconflict them with existing and future activities in the NY Bight (BOEM 2021a).

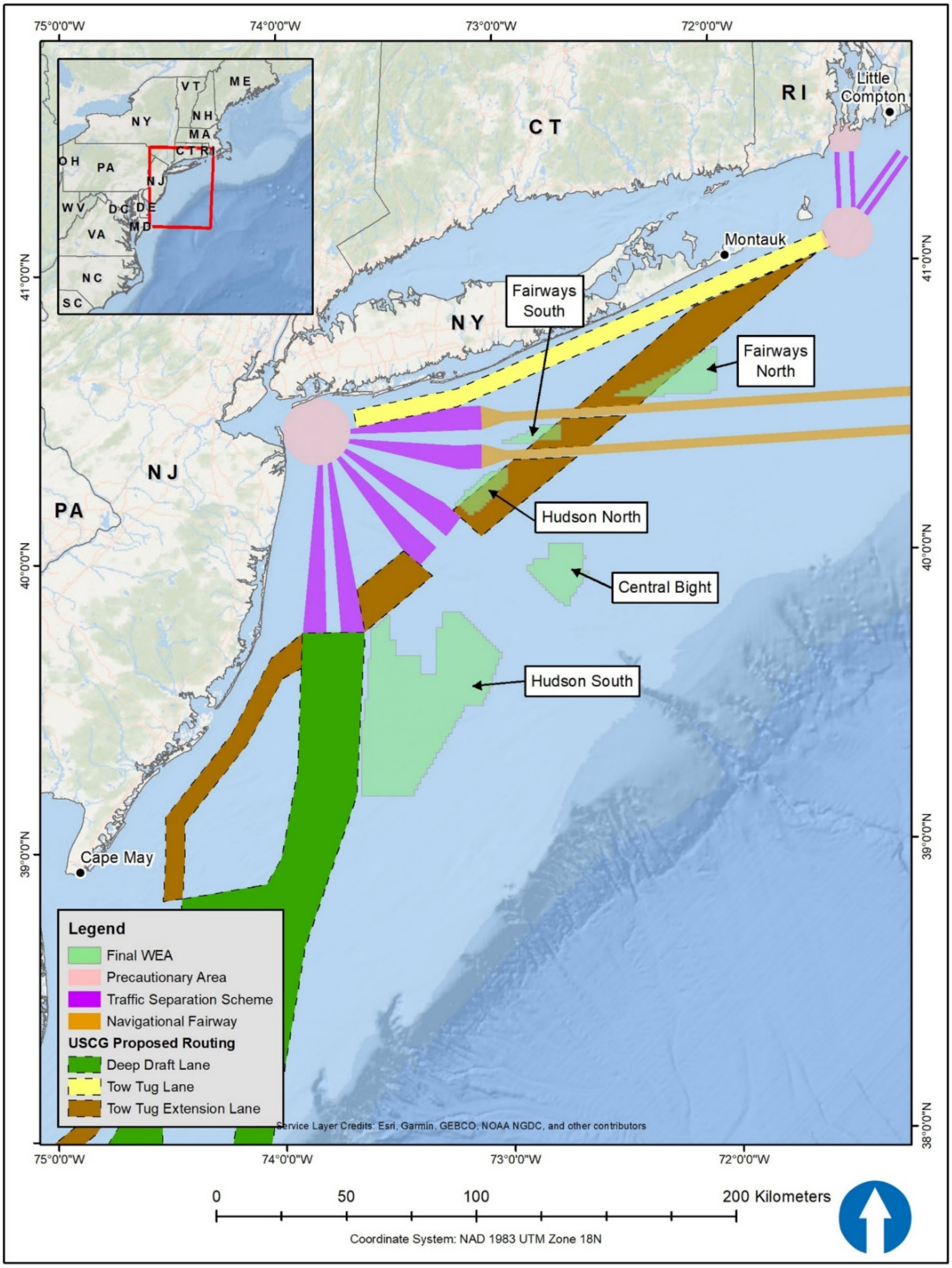

Figure 9. Navigation schemes near the NY Bight Wind Energy Areas (WEAs)

Over the timeframe of the Proposed Action, national security and military interests will continue to use the onshore and offshore areas in the NY Bight 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 NY Bight. Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). Despite this determination, the general trend along the coastal region from Virginia to Maine is that port activity will increase minimally over the timeframe of the Proposed Action.

Conclusion

Although leases would not be issued under the No Action Alternative, 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**).

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 NY Bight for a substantial amount of time. In addition, vessels and aircraft conducting military operations are typically working in military OPAREAs away from commercial traffic lanes. All project types listed in the Planned Actions Scenario (**Appendix D**) would result in increased vessel traffic in the region; some projects 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 NY Bight 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 patters 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 would result in **minor** adverse impacts to military use and navigation/vessel traffic.

4.2.6 Sea Turtles

Four species of sea turtles occur in the NY Bight. 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 NY Bight and is therefore not expected to occur in the WEAs. NYSERDA (2021) contains detailed information on the species of sea turtles expected to occur in the lease area, including sightings information. For information regarding 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 estimates difficult, but leatherback nesting trends (aside from the western Caribbean) are generally stable or increasing (NMFS and USFWS 2013); 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 criterion (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 turtle estimates that nesting trends are generally increasing (Seminoff et al. 2015).

Regional, pre-existing threats to sea turtles include entanglement in fisheries gear, fisheries bycatch, and vessel strike. Commercial fisheries occurring in the NY Bight 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 which transit through the NY Bight include cargo, passenger, recreational, tug-tow, military, and tanker (BOEM 2021a).

Conclusion

Although leases would not be issued under the No Action Alternative, 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 to 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, 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, acknowledging that sea turtle hearing is poorly understood (Finneran et al. 2017; Popper et al. 2014). Otherwise, it is anticipated that sea turtles may experience behavioral disturbance impacts from pile driving noise. Based on current and anticipated future impact avoidance and minimization requirements, impacts to sea turtles from construction-related noise would likely be limited to minimal or moderate short-term effects on a small number of individuals and would not be significant at the population level.

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. 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 4.2.1**, offshore wind structures could increase sea turtle prey availability through creating new hard bottom habitat and could attract some fish species, resulting in some beneficial impacts for sea turtles. However, recreational and commercial fishing efforts could increase nearby and present entanglement and strike risks to sea turtle species. These structures may also displace sea turtles from the area, potentially reducing exposure to commercial and recreational fishing activity in the WEAs. 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 to sea turtles because the overall effect would be unavoidable, as some individuals will likely experience disturbances, but the affected individuals would be expected to recover completely.

4.3 Alternative B – Proposed Action/Preferred Alternative

4.3.1 Benthic Resources

The main impacts on benthic organisms from routine 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 within a radius around the anchor from both the anchor footprint and the mooring line (**Section 2.2**). 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 will be short term, localized, and only occur for a maximum of 20 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). Geotechnical and benthic sampling may disturb, injure, or cause mortality to benthic resources in the immediate area sampled. BOEM estimates that approximately 5,805 geotechnical/benthic samples would be taken by the lessee for site characterization under Alternative B (see **Appendix A** for geotechnical 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 NY Bight are not expected to result in the loss of any species diversity or ecosystem function. Additionally, recovery of the soft-bottom 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) (Brooks et al. 2006; Kritzer et al. 2016; Lindholm et al. 2004). Organisms from adjacent, unaffected sediments could migrate to the location where a grab or core had been taken, resulting in rapid recovery. Benthic impacts from site characterization activities are expected to be **minor**.

Beds of submerged vegetation 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. However, the number of inshore samples collected along the transmission cable route is expected to be small along each route corridor. 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). Stony corals are present in the NJ artificial reef sites (Geo-Marine Inc. 2010). Hardbottom habitats (e.g., rocky reef communities) may exist in small, isolated patches, and data collected during initial remote geophysical surveys could identify possible locations for these communities. Met buoys will only be installed in the WEAs and BOEM would require the lessee to develop and implement avoidance measures near these resources before authorizing activities that would disturb the seafloor.

A spar-type met buoy is estimated to disturb a maximum of 118 m^2 of seafloor between its clump anchor and mooring chain. Anchor mooring chains for boat-shaped or discus-shaped met buoys are assumed to have a sweep affecting an area of about 34,398 m^2 (BOEM 2014a; Fugro Marine GeoServices Inc. 2017). Disturbance from installation of a met buoy would result in a maximum impact area of 34,398 m^2, inclusive of anchor chain sweep, per buoy. Assuming the maximum number of met buoys (20) are installed throughout all the WEAs, all are either boat-shaped or discus-shaped, and they disturb the maximum area of seafloor, a total of 170 ac of seafloor could be affected. 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 soft-bottom community (Michel et al. 2007). With a maximum of only 20 met buoys installed, this additional hard surface would be negligible.

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. 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 items for listed species (e.g., whales, sea turtles, sturgeon), and impacts to 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 to protected species resulting from benthic disturbance are expected to be **negligible** (Anderson 2021; BOEM and USACE 2013).

Non-Routine Events

Non-routine events that could potentially have benthic impacts include recovery of lost survey equipment. 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 larger the equipment lost, or the more costly it would be to replace, would dictate the number of attempts made at recovery. The number of attempts made at recovery would affect both the size of resultant impact area and the time spent searching. Additionally, where the equipment is lost would dictate the impact on other resources. Because the WEAs are predominantly composed of sand substrate, it is generally anticipated that the benthos would recover quickly (Brooks et al. 2006; Kritzer et al. 2016; Lindholm et al. 2004). Impacts from non-routine events are expected to be **negligible**.

Conclusion

Overall, impacts to benthic resources are expected to be **minor**. Impacts of routine activities including site characterization surveys and construction and operation of met buoys on benthic communities are expected to be **minor**, except for buoy removal, which is expected to have **negligible** impacts. Primary effects of routine activities 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 between 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 5**).

Impacts to 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.

4.3.2 Commercial and Recreational Fishing

The proposed site characterization and site assessment activities involve installation, maintenance, and decommissioning of met buoys inside each WEA and surveys for site characterization within each WEA and along each transmission cable route. These activities would result in increased boat traffic in the area and the temporary exclusion/displacement of vessels to prevent conflicts and collisions with survey vessels and gear. The Proposed Action includes installation of a maximum of 20 met buoys, which take approximately 1 to 3 days to complete depending upon met buoy type (**Section 2.2.4**). 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. Regardless, impacts to 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 could need to retrieve their gear before a survey vessel in their fishing location could potentially transit over their gear).

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 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 impact of these noise sources on fish is analyzed in **Section 4.3.3**. and expected to range from **negligible** to **minor**.

As also noted in **Section 4.3.3**, 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. Additionally, the buoys themselves may provide habitat for pelagic species such as dorado (also known as dolphinfish). Installation of met buoys could, therefore, have a temporary 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 4.3.1** and **4.3.3**, 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 area available for commercial and recreational fishing.

Prior to identification of the final WEA, major areas of fishing interest were removed to minimize potential conflict between activities (BOEM 2021a). Similarly, most coastal recreational fishing for NY and NJ takes place away from the WEAs (Geo-Marine Inc. 2010; New York Department of State 2013). Considering also the nominal increase in vessel traffic associated with the Proposed Action, impacts of increased vessel traffic to commercial and recreational fishing are anticipated to be **negligible**. Although commercial fishing vessels may transit the WEA en route to historical fishing grounds, survey activities or met buoy installation activities likely would not interfere with access to active fishing grounds beyond the WEAs, outside of the 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 would 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 at any of these ports or marinas would be small relative to existing use and are not expected to adversely impact current use of these facilities.

Non-Routine Events

Similar to the discussion presented in **Section 4.3.1**, non-routine events that could potentially have impacts on commercial and recreational fishing include recovery of lost survey equipment through the temporary displacement of fishing activities. The extent of impacts would depend on the type of lost equipment; the larger the equipment lost, or the more costly it would be to replace, would dictate the number of attempts made at recovery. The number of recovery attempts could affect the size of resultant impact area and time spent searching. The location where the equipment is lost would also dictate 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. In any case, the potential for recovery operations to interact with commercial or recreational fishing activities 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

Overall, impacts to commercial and recreational fisheries under the Proposed Action are expected to be **minor**. Impacts 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 20 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.

4.3.3 Finfish, Invertebrates, and Essential Fish Habitat

Review of previous lease issuance EAs and the Atlantic G&G Final PEIS (**Table 2**) identified potential impacts to fish resources and EFH that could occur in WEAs during site characterization and site assessment. Although all these previous documents do not specifically address the NY Bight area, many species occur across all areas, and the conclusions on impact levels are applicable to this EA. The following conclusions for site characterization that were made in previous EAs and the Atlantic G&G Final PEIS are expected to be the same in the NY Bight and will not be carried forward in this analysis:

- Impacts from acoustic sound sources from HRG surveys and geotechnical exploration are expected to range from **negligible** to **minor**. A boomer sub-bottom profiler is the only sound source expected to produce sounds within finfish and invertebrate hearing ranges (**Table 6**). Fish are not expected to be exposed to sound pressure levels (SPLs) that could cause hearing damage. 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. Vessel and equipment noise associated with the Proposed Action would be inconsequential relative to existing vessel noise in the geographic analysis area.

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 only a maximum of 20 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 area of the anchor chain sweep as discussed in **Section 4.3.2**. 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 between 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. Additionally, the buoys themselves may provide habitat for pelagic species such as dorado (also known as dolphinfish). 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 only a total of 20 met buoys could be installation across all WEAs. As discussed in **Section 4.3.2**, removal of met buoys are expected to be **negligible** to finfish and invertebrate populations, and EFH.

Biological surveys, primarily fishery surveys, would likely result in some direct mortality to finfish and invertebrates. Generally, methodologies employed in fisheries surveys include returning most of the animals back to the sea a 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 4.2.3**. Although the overall impacts to finfish and invertebrates from biological surveys are anticipated to be **negligible**, 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 (**Section 5**).

Geotechnical and benthic sampling may impact HAPCs (**Figure 8**) in the immediate area sampled. BOEM estimates that approximately 5,805 geotechnical/benthic samples would be taken by the lessee for site characterization under Alternative B (see **Appendix A** for geotechnical sampling calculations). However, geotechnical and benthic sampling that could occur within inshore areas (including within HAPCs) associated with the potential transmission cable routes would be a small number of samples. As discussed in **Section 4.3.2**, 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 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 to HAPCs from geotechnical and benthic sampling are expected to be **negligible**.

Non-Routine Events

Similar to **Section 4.3.2**, non-routine events that could potentially have impacts on finfish and invertebrate populations and EFH include recovery of lost survey equipment. The extent of impacts would depend on the type of lost equipment and if it can be recovered. The larger the equipment lost, or the more costly it would be to replace, would dictate the number of attempts made at recovery, affecting the size of the resultant impact area and time spent searching. Additionally, where the equipment is lost would dictate 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 4.3.1**, the impacts to finfish and invertebrate populations, and EFH resulting from the recovery of lost equipment are expected to be **negligible**.

Conclusion

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

4.3.4 Marine Mammals

Factors that could potentially have an impact on marine mammals from the Proposed Action include acoustic effects from HRG surveys and vessel and equipment noise; benthic habitat effects; vessel collision effects; and various effects from the installation, operation, and decommissioning of met buoys. BOEM has developed SOCs for lessees and operators, which are designed to prevent or reduce possible impacts to marine mammals during site characterization and site assessment activities (**Section 5**).

Impacts from site characterization have been analyzed in the PEIS and EA documents provided in **Table 2**. 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**. Acoustic signals from HRG survey equipment 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 potential for adverse impacts under 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. Although the conclusion for the Proposed Action remains the same as the previous analyses, harassment of marine mammals under the MMPA is the focus of this analysis because a programmatic consultation on the impacts of HRG surveys has been already completed and applies to this action. Under the MMPA, new information has become available about the propagation of these sources since those 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 analysis; 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**). However, lease stipulations that have been developed for other projects will be used as appropriate (**Section 5**), and new stipulations could be developed if needed for the Proposed Action.

- 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**. 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 (**Chapter 5**). Also, new stipulations could be developed if needed for the Proposed Action.

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 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 NY Bight 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, and assuming the lessee would follow BOEM guidelines to meet the geophysical data requirements at 30 CFR §585.610–585.611 and 30 CFR §585.626(a), surveys using these equipment are 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, while the higher frequencies (≥ 85 kHz) of the source are rapidly attenuated 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, USBLs were not considered for take assessment in the Gulf of Mexico incidental take regulation published on January 19, 2021 (86 *FR* 5322), and incidental take authorizations (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 medium-penetration SBPs (e.g., sparkers, boomers) and shallow-penetration, non-parametric SBPs (e.g., Compressed High-Intensity Radiated Pulses [CHIRPs]) were considered in this assessment.

Impacts from underwater noise in marine mammals may include Level A Harassment (i.e., permanent threshold shift [PTS]) 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 (2018a) 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 13**). No otariid pinnipeds are expected to occur in the NY Bight, so this hearing group was not included in the assessment. These criteria represent the most recent guidance from NMFS.

Table 13. 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 (2018a).
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 a specified time period (i.e., 24 hours).

Currently, the recommended Level B thresholds recommended by NMFS in 2012 are provided as unweighted SPL to assess behavioral impacts (NOAA Fisheries 2021b). 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, some which may be negligible, while others can have more biologically severe consequences. An increasing number of studies indicate that the effect of underwater sound on marine mammal behavior is quite variable between species, individuals, life history stage, and behavioral state (Ellison et al. 2012; Wood et al. 2012). Additionally, some species (e.g., beaked whales and porpoises or migrating baleen whales) or animals in certain behavioral states may be more sensitive to disturbance, while other species may be more tolerant to environmental noise (Wood et al. 2012). Some marine mammal species may show tolerance of some noise in certain frequency bands, while different frequency contents may elicit stronger responses (Nowacek et al. 2004).

To assess the potential for impacts from underwater noise, BOEM calculated the ranges to threshold criteria provided above for each marine mammal hearing group. The calculations apply the information from **Table 6**, which reports the highest source levels from Crocker and Fratantonio (2016) or manufacturer for each equipment category. The NMFS User Spreadsheet Tool (NMFS 2018b) was used to calculate distances to the PTS PK thresholds for impulsive omnidirectional sources, and, for sources with beamwidths less than 180°, a MATLAB script developed by NMFS Office of Protected Resources based on the work from Sivle et al. (2015) was used to calculated ranges to the PTS SEL_{24h} thresholds. Ranges to behavioral thresholds were calculated using interim guidance from NMFS Office of Protected Resources (2018a) for sources with beamwidths less than 180° and by applying spherical spreading loss to the source level for equipment with beamwidths greater than 180°. Results of these calculations are provided in **Table 14**.

Table 14. Ranges to threshold criteria for PTS and behavioral disturbances in marine mammals for HRG survey equipment

	PTS Onset Range (m)								Behavior Range (m)
HRG Equipment Category	Low-Frequency Cetaceans		Mid-Frequency Cetaceans		High-Frequency Cetaceans		Phocid Pinnipeds		All Marine Mammals
Medium-penetration SBP	*PK*	*SEL_{24h}*	*PK*	*SEL_{24h}*	*PK*	*SEL_{24h}*	*PK*	*SEL_{24h}*	*SPL*
Boomers	0	< 1	0	< 1	5	< 1	0	< 1	44
Sparkers	2	1	0	1	14	4	2	1	501
Bubble guns	0	1	0	1	1	1	0	1	79
Shallow-penetration, non-parametric SBP (CHIRPs)	*SEL_{24h}*		*SEL_{24h}*		*SEL_{24h}*		*SEL_{24h}*		*SPL*
EdgeTech 512i	< 1		< 1		< 1		< 1		7
Knudsen 3202	< 1		1		53		< 1		53

CHIRP = Compressed High-Intensity Radiated Pulses; HRG = high-resolution geophysical; NMFS = National Marine Fisheries Service; PK = zero-to-peak sound pressure level; PTS = permanent threshold shift; SBP = sub-bottom profiler; SEL_{24h} = sound exposure level over 24 hours; a measure of the total sound energy of an event or multiple events over a specified time period (i.e., 24 hours); SL = source level; SPL = sound pressure level.
PTS onset ranges were calculated with the NMFS User Spreadsheet Tool (NMFS 2018b) for omnidirectional sources, and a MATLAB script developed by NMFS for sources with beamwidths < 180°. Behavioral disturbance ranges were calculated using interim guidance from NMFS (2018a) for sources with beamwidths < 180° and by applying spherical spreading loss to the SL for omnidirectional equipment. All sound source characteristics were found in Crocker and Fratantonio (2016) or manufacturer specifications.

The results of the analysis (**Table 14**) show the risk of PTS in marine mammals is low, with the largest range to the PK threshold of 14 m for high-frequency (HF) cetaceans for the sparkers, and the largest SEL_{24h} threshold range of 53 m for HF cetaceans for one of the CHIRPs. Range for all other hearing groups and equipment were negligible (< 5 m). However, as stated previously, the source information used to estimate these ranges was based on the maximum source output measured by Crocker and Fratantonio (2016) when, in actuality, sources may be operated using a range of power and frequency options, which would reduce the source level. Therefore, these ranges should be viewed as conservative estimations of actual sound levels that would be expected during future surveys. Furthermore, the SEL_{24h} threshold criteria assumes that the animal remains within the ensonified area for a full 24 hours to receive sound level sufficient to result in PTS, but this assumption is very unlikely to occur given animal movement and visual monitoring by protected species observers (PSOs).

The maximum range to behavioral threshold criteria was 501 m for sparker sources; ranges for all other sources were < 100 m. The threshold range for the sparkers was calculated using source information, which assumed the maximum power output of 2,400 J (Crocker and Fratantonio 2016). Data from surveys conducted in wind farm leases up to this point indicate that developers operate sparker sources at a lower power setting (< 800 J), which reduces the source level and subsequent threshold range (86 *FR* 18943, 86 *FR* 26465, 86 *FR* 11930). Therefore, monitoring of a 500-m zone would be effective for detecting most marine mammals exposed to above-threshold noise levels (**Section 5)**. Shutdown procedures would minimize the number of individuals affected and the severity of their responses, and no permanent, population-level impacts are expected to occur. These results suggest that the 100-m exclusion zone is adequate to minimize the potential for hearing injury (Level A Harassment under the MMPA), as well as the majority of behavioral impacts (Level B Harassment under the MMPA) for the sound sources associated with HRG surveys. 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**.

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 is required to apply for an ITA under the MMPA and adhere to the requirements of the authorization (30 CFR §585.801(e)). In addition, lessees are required to send a copy of the authorization to BOEM (30 CFR §585.801(f)) prior to commencing the Proposed Action.

Potential impacts to marine mammals include strikes from vessels used during site assessment and site characterization activities. BOEM anticipates that a range from 766 to 806 round trips of various vessel types may occur as a result of the activities covered in this EA (**Appendix A**). Because the volume of commercial vessel traffic in the NY Bight is high, marine mammals within the area would need to transit near the commercial shipping lanes to get to and from the WEAs (**Section 4.2.5**). It is unlikely that any site characterization and site assessment activities would measurably increase the risk of a collision between a marine mammal and non-Proposed Action related vessels operating in the vicinity of the WEAs. Considering BOEM's required implementation of the SOCs for HRG surveys, and geotechnical surveys (**Section 5**), any slight increase in vessel strike risk by non-Proposed Action related vessels would be reduced to **negligible** levels. BOEM's SOCs were designed to minimize potential vessel strikes to marine mammals (**Section 5**). BOEM and USACE (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. Potential impacts to marine mammals from vessel strikes during site assessment activities are therefore expected to be **negligible** because of the low probability of such an event. Nonetheless, if a low-probability vessel strike did occur they could result in **minor** to **moderate** impacts to ESA-listed marine mammals.

The potential for marine mammals to interact with the buoy and to become entangled in the buoy or mooring system is extremely unlikely given the low probability of a marine mammals encountering one 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; BOEM and USACE 2013). Potential impacts to marine mammals 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, 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 to marine mammals due to loss of habitat, changes to prey abundance, and distribution from installation of met buoys are expected to be **negligible**. As more information becomes available, BOEM will continue to reassess required mitigation measures.

Non-Routine Events

Non-routine events that could affect marine mammals consist of the recovery of lost equipment 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

Overall, impacts from site characterization and site assessment activities to marine mammals in the WEAs are expected to be **minor**. However, impacts would 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. 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 5**) 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 to 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.

4.3.5 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 the 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 (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 766 to 806 over a 5- to 7-year period. Vessel traffic anticipated as a result of Proposed Action would add to the existing vessel traffic in the NY Bight.

The additional vessel traffic 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 vessel traffic associated with Proposed Action are expected to be **negligible**.

The majority of vessel traffic in the NY Bight is within TSS lanes, following distinct patterns to approach/depart the TSS lanes, and in a corridor parallel and close to the NJ 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 June 2020 USCG Advanced Notice of Proposed Rulemaking, a tow-tug extension lane would overlap three of the WEAs (Hudson North, Fairways South, and Fairways North) as shown in **Figure 9**. 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 4.3.2**, non-routine events that could potentially have impacts on military use and navigation/vessel traffic include recovery of lost survey equipment through temporary space-use conflicts. The extent of impacts would depend on the type of lost equipment. The larger the equipment lost, or the more costly it would be to replace, would dictate the number of attempts made at recovery. The number of recovery attempts could affect the size of resultant impact area and time spent searching. Additionally, the location where the equipment is lost would dictate 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, and 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. Overall, BOEM anticipates that impacts to 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 met buoys 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.

4.3.6 Sea Turtles

Impacts from site characterization have been analyzed in the NMFS Biological Opinion (Anderson 2021; BOEM and USACE 2013) and ESA consultation conducted for the Proposed Action (Anderson 2021), in addition to the PEIS and EA documents provided in **Table 2**. 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. 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. As such, BOEM would require a lessee to implement SOCs to minimize acoustic impacts (**Section 5**), and new stipulations could be developed if needed for the Proposed Action.
- 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. BOEM would require a lessee to implement a clearance zone for sea turtles prior to commencing surveys (**Section 5**), 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) (**Section 5)**. In general, lease stipulations that have been developed for other projects would be used as appropriate (**Section 5**), and new stipulations could be developed if needed for the Proposed Action.

Therefore, these impacts to 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 collisions. The likelihood of collision 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 annual number of vessel trips associated with the proposed lease would range from 766 to 806 round trips based on the total trips for site characterization and site assessment over the timeframe of the Proposed Action. The number of annual trips from site characterization and site assessment activities represents a fraction of the vessel trips occurring in the NY and NJ ports area each year. 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 (NYSERDA 2017c). 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 (**Section 5**). 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 to 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 for sea turtles. Potential impacts to 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 collisions or boat-related injuries, behavioral changes, or displacement from the area (Anderson 2021; BOEM and USACE 2013). However, with the implementation of the vessel strike avoidance measures required by the SOCs (**Section 5**), 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; BOEM and USACE 2013). Therefore, potential impacts to 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**.

Non-Routine Events

Non-routine events that could affect sea turtles consist of the recovery of lost equipment 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. Regardless, the potential for sea turtles to interact with the grapnel line and to become entangled is extremely unlikely 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

Overall, impacts to sea turtles are expected to be **minor**, with potential impacts to sea turtles ranging from **negligible** to **minor** depending on the activity being conducted; effects would 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 5**) would minimize the potential for vessel strikes and adverse impacts on sea turtles.

5 Standard Operating Conditions

The proposed action includes Standard Operating Conditions (SOCs) to reduce or eliminate the 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 and will continue to be avoidance. For example, the exact location of met buoys would be adjusted to avoid adverse effects to offshore cultural resources or biologically sensitive habitats, if present.

Utilizing the best available science, and in consultation with NMFS, the agency primarily responsible for overseeing 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 the MMPA. The proposed SOCs include the following requirements for geophysical survey shutdown zone monitoring, survey equipment powerup, and post-shutdown 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 are described in Addendum C of each proposed Commercial Lease;[4] the NMFS ESA consultation concurrence letter (Anderson 2021);[5] and the Data Collection Biological Assessment (Baker and Howson 2021).[6] 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 has 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, standard 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 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 PSO confirms that the animal has exited the 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 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

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

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 the 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 as new information becomes available or as may be required through any MMPA ITAs applied for by project proponents.

6 Consultation and Coordination

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

6.1 Public Involvement

6.1.1 NY Bight Renewable Energy Intergovernmental Task Force Meetings

BOEM held a NY Bight Renewable Energy Intergovernmental Task Force (Task Force) meeting on May 9, 2018. The meeting's purpose was to present necessary background information to facilitate an informed discussion about BOEM's Call (**Section 2.1**), which requests comments from the public about areas of the OCS that they believe should receive special consideration and analysis for the potential development of renewable energy. The Call was previously published by BOEM on April 11, 2018. At the meeting, BOEM also set out to solicit feedback from the Task Force on BOEM's approach to Area ID analysis and stakeholder engagement; update the Task Force and stakeholders on recent state and developer activities; and provide opportunities for public input about the topics being considered by the Task Force.

During the meeting, members of the Task Force, other regional representatives, and the public heard updates on the BOEM's leasing effort in the NY Bight. BOEM staff reviewed the Call, which identified four potential areas for offshore wind leasing, as well as next steps for Area ID. The Task Force heard subject matter presentations on visual impacts, avian and marine protected species, navigation and technical analysis, and fisheries. Representatives from the States of NY and NJ presented updates on state initiatives, procurement, and stakeholder engagement efforts. Representatives of developers with leases in the region also presented updates on their respective lease activities. Task Force members had an opportunity to discuss the Call Area in small groups, and the meeting provided two opportunities for public input on topics being considered by the Task Force.

A second meeting was held on November 28, 2018. During that meeting, members of the Task Force, other regional representatives, and the public heard updates on the BOEM's leasing effort in the NY Bight. BOEM staff reviewed the Call, which identified four potential areas for offshore wind leasing and the development process for the Draft WEAs. The Task Force heard updates and reactions to the Draft WEAs from DOD, USCG, NMFS, and the Responsible Offshore Development Alliance (a new organization representing a broad range of fisheries interests). Representatives from the States of NY and NJ presented updates on their procurement plans and reactions to the Draft WEAs. Task Force members had an opportunity to discuss the Draft WEAs in small groups. Representatives of regional wind energy and infrastructure developers also presented updates on their respective activities. The meeting closed with a presentation on the next steps and timeline for this leasing process, and the meeting provided two opportunities for public input on topics being considered by the Task Force.

Two additional meetings were held on April 14 and 16, 2021. During these meetings, members of the Task Force, other regional representatives, and the public heard updates on the BOEM's leasing effort in the NY Bight. BOEM staff introduced the NY Bight WEAs proposed to be offered for lease in late 2021 and provided an overview of and sought in-depth feedback on the draft Proposed Sale Notice (PSN) and related auction format. The WEAs included in the PSN are a subset of the WEAs analyzed in this EA; Fairways North and Fairways South were not included in the PSN. The Task Force also heard updates and reactions to the Draft PSN from DOD, USCG, NMFS, and USACE. Representatives from the States of NY and NJ presented their reflections on the PSN and updated the Task Force on offshore wind energy development activities in their respective states. Task Force members also had an opportunity to discuss the Draft PSN in small groups. Over the two days, there were also two opportunities for public input on topics being considered by the Task Force. The meeting closed with a presentation on the next steps and timeline for the leasing process.

On June 11, 2021, BOEM published the PSN.[7]

At each Task Force meeting, all attendees were provided opportunity to raise issues and concerns about the Call and the Draft WEAs in order to assist BOEM in developing documentation to support the Final WEA decision. Full summaries of each meeting and associated presentations made at each meeting can be found at the relevant links here by clicking on the "History" tab at www.boem.gov/renewable-energy/state-activities/new-york-bight.

6.1.2 Notices to Stakeholders

On March 29, 2021, BOEM released the Announcement of Area ID.[8] The Area ID Memorandum documents the analysis and rationale used to develop recommendations for WEAs in the NY Bight. Also on March 29, 2021, BOEM released a Notice to Stakeholders to indicate BOEM's intent to prepare an EA for the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf of the New York Bight*. BOEM solicited input on issues and alternatives to be analyzed in the EA, and accepted comments until April 28, 2021. During the 30-day comment period, BOEM received approximately 3,000 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 concern:

- Concern that the process is moving too quickly and should be paused for information, analysis, and results from existing projects (most common concern)
- Concern that BOEM should conduct an EIS instead of an EA in order to include cumulative analysis and address the entire process, not just pre-lease activities
- Concern for impacts of various species, with most concern for whales
- Concern for navigation, including spacing of turbines and increased traffic in an already crowded area
- Concern for impacts on the fishing industry access to areas, as well as effects on fish both behavioral and from habitat changes

The comments can be viewed at www.regulations.gov by searching for docket ID BOEM-2021-0021.

Additionally, a Notice to Stakeholders issued in conjunction with the publication of this draft EA initiates a 30-day public comment period. Comments can be submitted via www.regulations.gov under docket ID

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[7] Available at www.regulations.gov/document/BOEM-2021-0033-0001

[8] Available at www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/NYBight-Wind-Energy-Areas-Summary.pdf

BOEM-2021-0054. During the comment period, virtual public meetings will be held to exchange information between BOEM, stakeholders, and the general public. Current information about the project and public meetings is available online at www.boem.gov/renewable-energy/state-activities/new-york-bight.

6.2 Consultations

6.2.1 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 has consulted informally with USFWS and formally with 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 an SAP within the NY Bight. BOEM submitted the biological assessment to USFWS on August 10, 2021, and requested 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 and bat species.

NMFS

The activities that may ensue as a result of the issuance of leases in the NY Bight are subject to a programmatic consultation with NMFS (Anderson 2021; Baker and Howson 2021). BOEM and NMFS are discussing the need for any additional consultation under the ESA. If additional activities that are beyond the scope of the programmatic consultation are identified, additional consultation will be completed before those activities occur.

6.2.2 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 600. Certain OCS activities authorized by BOEM may result in adverse effects on EFH and, therefore, require consultation with NMFS. Concurrent with this EA, BOEM will consult with NMFS regarding the impacts of the Proposed Action on EFH. BOEM has determined that the Proposed Action would not significantly affect the quality and quantity of EFH.

6.2.3 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 930 Subpart C). BOEM will prepare 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 meteorological towers and buoys) in the NY Bight WEAs are consistent to the maximum extent practicable with the provisions identified as enforceable by the Coastal Zone Management Programs of the states of NJ and NY.

BOEM has determined that NJ and NY share common coastal management issues and have similar enforceable policies as identified by their respective coastal zone management plans. Given the proximity of the WEAs to each state, the similarity of the reasonably foreseeable activities for the WEAs, and the similarity of impacts on environmental and socioeconomic resources and uses within each state, BOEM will prepare a single CD under 15 CFR 930.36(a) to determine whether issuing a lease and site assessment activities (including the installation, operation, and decommissioning of a meteorological tower and/or buoys) in the WEAs is consistent with the enforceable policies of the NJ and NY 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. The states have 60 days to review the CD after they receive it. Additionally, the states have 14 days after receiving the CD to identify any missing information required by 30 CFR 930.39(a) and notify BOEM.

6.2.4 Government-to-Government Consultations with Federally Recognized Tribes

BOEM recognizes the unique legal relationship of the U.S. with tribal governments 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 has initiated consultations with the following nine federally recognized Native American Tribes with historic and cultural ties to the region under consideration in the EA: Absentee-Shawnee Tribe of Indians of Oklahoma, Delaware Tribe of Indians, Mashantucket Pequot Tribal Nation, Mohegan Tribe of Connecticut, Shawnee Tribe, Stockbridge-Munsee Community Band of Mohican Indians, the Delaware Nation, the Narragansett Indian Tribe, and the Shinnecock Indian Nation. As part of the consultation process, on May 13, 2021, BOEM invited these nine federally recognized Tribes to participate in the National Historic Preservation Act (NHPA) Section 106 consultations for the issuance of commercial wind energy leases within the NY Bight WEAs and associated site assessment and site characterization activities. On July 8, 2021, BOEM also invited these nine federally recognized Tribes to a government-to-government consultation meeting to discuss the PSN for the NY Bight. The Delaware Tribe of Indians attended the government-to-government consultation held on July 27, 2021. Three additional federally recognized Tribes—the Delaware Nation, the Stockbridge Munsee Community Band of Mohican Indians, and the Shinnecock Nation—either expressed interest in attending future consultations or receiving notes.

6.2.5 National Historic Preservation Act (Section 106)

Section 106 of the NHPA (54 U.S.C. § 306108) and its implementing regulations (36 CFR 800) require Federal agencies to consider the effects of their undertakings on historic properties and afford the

Advisory Council on Historic Preservation an opportunity to comment. BOEM has determined that issuing commercial or research leases within the NY Bight WEAs and granting ROWs and RUEs within the region constitutes an undertaking subject to Section 106 of the NHPA (16 U.S.C. 470f) and its implementing regulations (36 CFR § 800) as the resulting site characterization and site assessment activities have the potential to cause effects on historic properties.

BOEM has implemented Programmatic Agreements pursuant to 36 CFR § 800.14(b) to fulfill its obligations under Section 106 of the NHPA for renewable energy activities on the OCS offshore NY, NJ, and RI. BOEM initiated consultation through letters on May 3, 2021, with the NY State Historic Preservation Office (SHPO), NJ SHPO, RI SHPO, Advisory Council on Historic Preservation, and following federally recognized Tribes: Absentee-Shawnee Tribe of Indians of Oklahoma, Delaware Tribe of Indians, Mashantucket Pequot Tribal Nation, Mohegan Tribe of Connecticut, Narragansett Indian Tribe, Shawnee Tribe, Shinnecock Indian Nation, Stockbridge-Munsee Community, and the Delaware Nation. BOEM has further identified potential consulting parties pursuant to 36 CFR § 800.3(f) through a May 3, 2021, letter to over 500 entities including certified local governments, historical preservation societies, museums, and state-recognized Tribes soliciting public comment and input regarding the identification of, and potential effects on, historic properties for the purpose of obtaining public input for the Section 106 review (36 CFR § 800.2(d)(3)) and inviting them to participate as a consulting party. BOEM prepared a Finding of No Historic Properties Affected, consistent with 36 CFR § 800.4(d)(1), which was provided to the consulting parties on July 6, 2021.

Appendix A: Vessel Trips and Scenarios

This appendix provides the proposed action scenario assessed in the New York Bight 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, as well as timing of some surveys.

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

Location	Vessel Type	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%	56,946.54	6,833.04	284.71	9.49	5,158.94	10
	12 hr vessel 30%	24,405.66	2,928.44	244.04	8.13	n/a	245
Grand Total Transmission Backbone	24 hr vessel 30%	6,932.17	831.79	34.66	1.16	628.00	2
	12 hr vessel 70%	16,175.06	1,940.85	161.74	5.39	n/a	162
Grand Total Wind Energy Areas	24 hr vessel 100%	166,221.91	19,945.03	831.04	27.70	15,058.50	28
Grand Combined Totals		**270,681.34**	**32,479.16**	**1,556.19**	**51.87**	**20,845.45**	**447**

Assumptions:
Transit Speed = 18.52 km/hr
Survey Speed = 8.334 km/hr
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 Wind Energy Area to account for line turns, anchoring, or other activities that may occur beyond the Wind Energy Area boundary.

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

Samples per day	Days	Trips
10 geotechnical samples per 24-hr day	324	11
20 benthic samples per 24-hr 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

Number of Samples

One geotechnical sample (vibracore, CPT, and/or deep boring) at every potential wind turbine location and transmission station location	689
One geotechnical sample (vibracore, CPT, and/or deep boring) every kilometer of transmission cable corridor	2,548
One benthic sample every kilometer of transmission cable corridor	2,548
One benthic sample at each buoy site	20
TOTAL	**5,805**

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
10	2	1	20	2	40

Maintenance - Quarterly/Monthly				
Number of leases	# buoys	# visits	Years	Total trips
10	2	4	5	200
10	2	12	5	600

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
10	2	1	20	2	40

Total		
Alternative	Low range	High range
A	240	280

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 RT + 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 RT + 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 RT + 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 RT (day 1 travel and set, three 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 kts • 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 kts • 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

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: Assessment of Resources with Negligible Impacts

B.1 Introduction

This appendix provides an assessment of resources with negligible impacts from implementation of the Proposed Action. **Section 4.1** of the main environmental assessment (EA) provides the assessment methodology used to determine impact levels.

B.2 Alternative A – No Action Alternative and Affected Environment

B.2.1 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 (EPA) to be protective of human health and welfare. The NAAQS have been established in 40 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 forms in the atmosphere from precursor pollutants such as nitrogen oxides (NO_x) and volatile organic compounds (VOC).

When the monitored pollutant levels in an area exceed the NAAQS for any pollutant, the area is classified as being in “nonattainment” for that pollutant. The coastal counties in New Jersey (NJ) and New York (NY) nearest the Wind Energy Areas (WEAs) include Monmouth, Ocean, and Hudson in NJ and Suffolk, Queens, Kings (also known as Brooklyn), Nassau, and Richmond (also known as Staten Island) in NY. All of these counties are in moderate non-attainment for O_3 (except Ocean, which is marginal), maintenance areas for $PM_{2.5}$ (except Ocean), and maintenance areas for CO (except Suffolk). All other criteria pollutants are in attainment.

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 WEAs is Brigantine Wilderness Area in NJ, which is approximately 88 km from the WEAs. Federal Land Managers must be notified of facilities that will be located within 100 km of a Class I area. It is not anticipated that activities in the WEAs will impact visibility in the Brigantine Wilderness Area.

Climate change is a global issue that results from the increase in greenhouse gases (GHGs) in the atmosphere. The most recently available data on GHG emissions in the U.S. indicate that annual emissions in 2019 were an estimated 6,558 million metric tons (EPA 2021). Additional information about the impacts of climate change is presented in **Appendix D**.

Conclusion

Although leases would not be issued under the No Action Alternative, the Bureau of Ocean Energy Management (BOEM) expects ongoing activities and planned actions to have continuing regional air quality impacts over the timeframe considered in the EA (**Appendix D**).

Over the life of the Proposed Action, in its absence, local impacts to air quality are likely to be small, incremental, and difficult to discern from effects of other pollutant sources. Offshore, the largest contributors to pollutant emissions are commercial marine vessels. Furthermore, additional, more polluting, fossil-fuel energy facilities could come, or would be kept on-line to meet future power demand and fired by natural gas, oil, or coal. These larger impacts would be mitigated partially by other future offshore wind projects surrounding the geographic analysis area, including other projects offshore NY and NJ (**Appendix D**).

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 air emissions and GHGs. The other reasonably foreseeable planned offshore wind projects could lead to reduced emissions from fossil-fuel power generating facilities and result in beneficial impacts on air quality.

B.2.2 Cultural, Historical, and Archaeological Resources

A number of documents report on the potential for submerged cultural resources within the NY Bight and Mid-Atlantic region and are incorporated herein by reference (BOEM 2012; BOEM 2016a; NYSERDA 2017; TRC Environmental Corporation [TRC] 2012). Submerged historic properties that may be located within the proposed WEAs include indigenous archaeological sites, shipwrecks, downed aircraft, and submerged architectural or built resources (NYSERDA 2017). Although no submerged pre-Contact era archaeological sites have been identified within the proposed WEAs, it has been theorized that such sites do exist. Much of the Outer Continental Shelf (OCS) offshore NY and NJ was subaerial before sea levels began to rise following the Last Glacial Maximum, approximately 20,000 before present (B.P.). The exposed landscape would have supported human populations from the Paleoindian through the Early Archaic periods, before sea levels submerged much of the proposed WEAs by 10,000 B.P. (BOEM 2016a). Portions of the OCS closer to shore through which export cable routes might traverse were submerged later and thus would have supported more recent populations. A theorized paleoshoreline reconstruction (**Figure B-1**) depicts the timing of marine transgression through the NY Bight. The TRC (2012) study determined that much of the seabed covered by the proposed WEAs is within an area considered to possess high sensitivity for containing submerged indigenous archaeological sites.

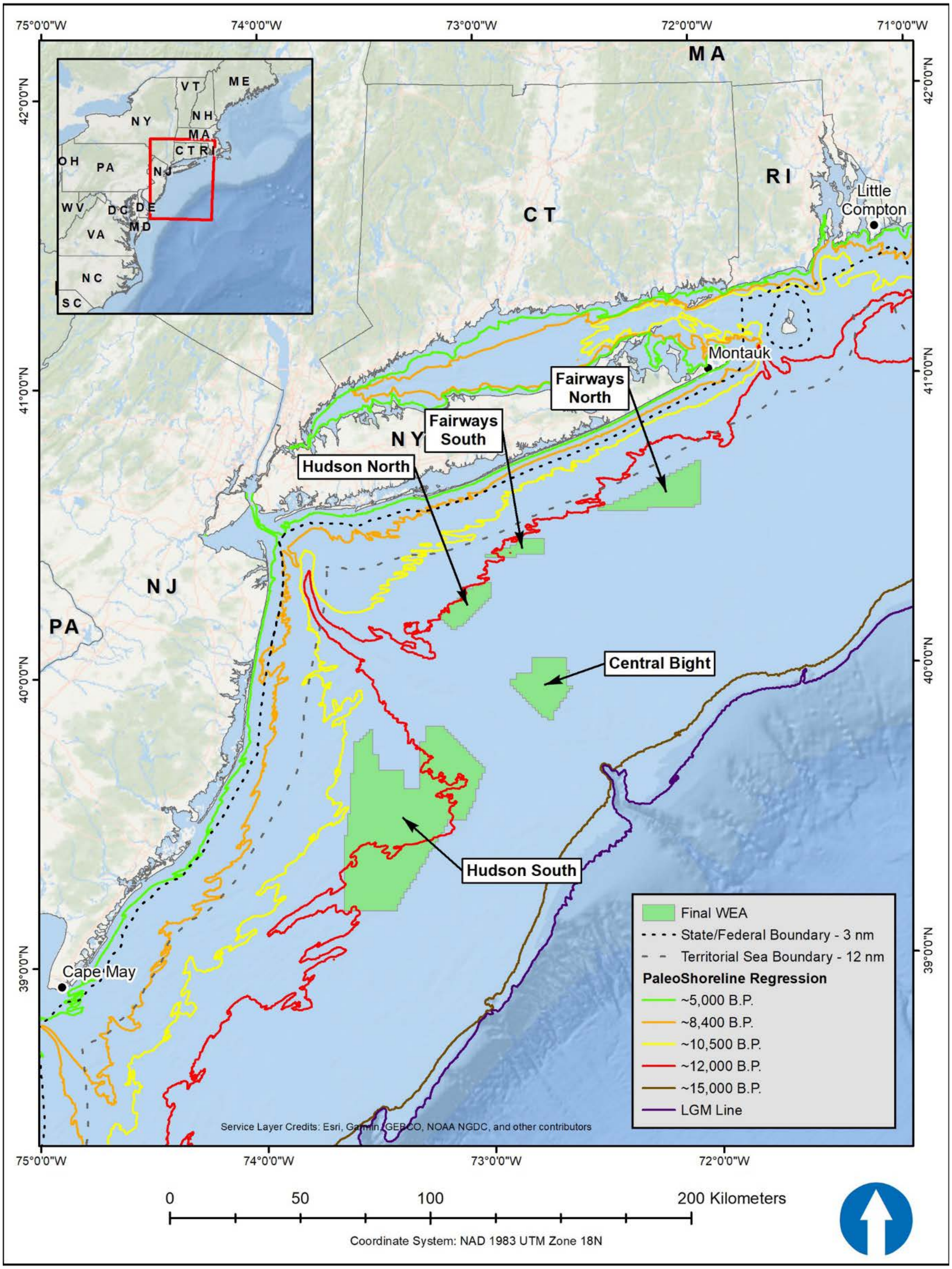

Figure B-1. Theorized paleoshoreline reconstruction in the New York Bight

Since the advent of colonial expansion into North America, NY has served as a major regional and global commercial hub. Numerous vessels have plied the waters offshore NY and NJ and, consequently, shipwrecks are a type of historic submerged cultural resources expected to be found within the NY Bight and the navigation routes that filter vessel traffic to the ports of NY and NJ. Several shipwreck databases (i.e., Automated Wreck and Obstruction Information System, Electronic Navigation Charts, Global Maritime Wrecks Database, New Jersey Maritime Museum) were consulted to assess the number of shipwrecks in the vicinity of the NY Bight; the number of reported wrecks range from roughly 500 to over 950 shipwrecks. The frequency of shipwrecks increases dramatically in nearshore areas; the database recording the largest number of shipwrecks within the proposed WEAs reports only 11 shipwrecks. Examples of other historic-era submerged cultural resources that may be encountered within the proposed WEAs and nearshore are downed aircraft, subsea cables, and other infrastructure (BOEM 2016a; NYSERDA 2017; TRC 2012).

Historic property types that may be within the onshore affected environment could include districts, sites, buildings, structures, or objects within the viewshed of site characterization and site assessment activities. Klein et al. (2012) includes an overview of common coastal historic property types that could fall within the viewshed of these types of characterization and assessment activities in the NY Bight. The affected environment for onshore historic properties could include portions of both the NY and NJ coastlines between Barnegat Light, NJ, and Southampton, NY. The WEAs vary from 23 to 69 nm off the coast of NJ, and from 15 to 45 nm off the coast of NY. Coastal properties with ocean views are potentially within the viewshed of site characterization and site assessment activities. Local topography is generally flat, and development in these areas is generally limited to one to three story buildings. Due to flat topography and consistent building heights, ocean views are generally limited to the first developed block along the coast. Beyond this area, views are blocked by intervening development. Outside of this area, the affected environment may also include resource types with elevated viewing platforms, such as lighthouses or lifesaving stations. Some historic properties have already been identified in Klein et al. (2012); however, additional historic properties are expected to fall within the affected environment.

Conclusion

Although leases would not be issued under the No Action Alternative, BOEM expects ongoing activities and planned actions to have continuing regional impacts on cultural, historical, and archaeological resources over the timeframe considered in the EA (**Appendix D**).

Ongoing and planned actions could adversely impact potentially significant submerged cultural resources. However, Federal law requires that offshore activities associated with renewable energy development, gas pipelines, and other submarine cable installers submit archaeological survey results and assessment of seafloor impacts to potential submerged cultural resources when bottom-disturbing activities are planned. Submerged cultural resource surveys identify significant resources and support a determination of their National Register of Historic Places eligibility. Based on the results of those surveys and assessments, the planned actions could be designed to avoid impacting known submerged cultural resources or minimize impacts to varying degrees. If potentially significant submerged cultural resources cannot be avoided, other measures to mitigate impacts would be required.

Additionally, ongoing and planned actions have the potential to impact the viewshed of coastal aboveground historic properties with open views in the direction of the NY Bight from the addition of wind energy structures (turbines and offshore substations) and vessels, and associated lighting.

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** to **major** adverse impacts. If submerged 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.

B.2.3 Recreation and Tourism

The analysis for recreation and tourism includes areas within 15 to 45 nm of the coastline of NY and 23 to 69 nm to the coastline of NJ (BOEM 2021). Though many recreation and tourism opportunities exist in inland portions of coastal counties in NJ and NY, the assessment for the EA focuses on the areas located along the shoreline that may depend on coastal settings. In 2012, BOEM conducted a study to identify areas on the Atlantic seacoast likely to experience impacts on tourism and recreational economies from offshore wind development (ICF Incorporated LLC 2012), which is incorporated in this section by reference. The study identified communities sensitive to impacts on tourism for employment and business and have relatively higher levels of tourism jobs. The most recent data available by the National Oceanic and Atmospheric Administration (NOAA) on ocean-related jobs linked to recreation and tourism is provided in **Table B-1** for the coastal counties near the WEAs. 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. Generally, these activities are anticipated to continue with no discernable trend for the timeframe of the Proposed Action.

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

County/State	Percent of Ocean-Related Recreation and Tourism Jobs
New Jersey	**69.1**
Bergen	83.1
Hudson	72.9
Union	38.8
Middlesex	13.9
Monmouth	94.9
Ocean	94.7
Atlantic	95.9
Cape May	94.9
New York	**91.7**
Kings (also known as Brooklyn)	94.0
Queens	83.8
Nassau	93.6
Suffolk	88.7

Source: (NOAA 2015).

Conclusion

Although leases would not be issued under the No Action Alternative, BOEM expects 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 to recreation and tourism in the geographic analysis area are primarily marine transportation (commercial shipping), commercial fishing, and military use; however, these have co-existed in the NY Bight 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 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, the 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 to recreation and tourism because the overall effect would be small, and the resource would be expected to recover completely.

B.3 Alternative B – Proposed Action/Preferred Alternative

B.3.1 Air Quality and Greenhouse Gas Emissions

Air emission sources for site assessment activities include vessels for site characterization activities and installation, operation, and decommissioning of up to 20 met buoys. Vessel traffic due to site characterization surveys and site assessment activities would add to current vessel traffic levels in NY Bight and to the existing ports used by the survey vessels. The additional vessel activity would be temporary and negligible when compared with existing vessel traffic levels in the region. Impacts from air pollutant emissions associated with these vessels would be localized within the WEAs and in the vicinity of vessel activity. Estimated potential criteria pollutant emissions and greenhouse gas emissions for the vessel operations were calculated and the results are provided in **Appendix C**. Estimated annual emissions for Years 1–7 are summarized in **Appendix C** (**Table C-1**). The numbers of vessel trips and associated emission calculations, along with the assumptions used to complete the calculations, are provided in **Appendix A**. Air emissions from onshore activities are assumed to be negligible in comparison with the existing 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 for the counties closest to the WEAs are as follows:

- 100 tons/year NO_x (O_3 precursor)
- 50 tons/year VOC (O_3 precursor)
- 100 tons/year CO
- 100 tons/year PM
- 100 tons/year SO_2

As indicated in **Appendix C** (**Table C-1**), estimated annual potential emissions are expected to be less than major source thresholds, are not expected to lead to any violation of the NAAQS, and, therefore, are expected to be **negligible**.

Non-Routine Events

Non-routine events that could affect air quality consist of the recovery of lost equipment 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**.

Conclusion

As shown in **Appendix C** (**Table C-1**), air pollutant concentrations due to emissions from the Proposed Action are not expected to lead to any violation of the NAAQS. Although the emissions estimates from site characterization and site assessment activities are measurable, they would not be distinguishable from other air emissions onshore or offshore; therefore, air pollutant and GHG emissions (**Appendix C**) associated with the Proposed Action are expected to be **negligible**.

B.3.2 Cultural, Historical, and Archaeological Resources

Expected impacts to offshore historic properties during routine activities would be similar to those described in previous EAs (**Table 2**; **Section 2.1**). As noted, HRG surveys do not create bottom disturbances, and thus impacts would not be expected to occur to historic properties during routine survey. Subsurface geotechnical investigations, benthic sampling, and installation of met buoys would disturb the seabed. However, existing Programmatic Agreements (BOEM 2011; BOEM 2016b), 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 archeologist 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 to 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 are expected to **negligible** (BOEM 2013; BOEM 2014; BOEM 2016a).

The Proposed Action is expected to include the temporary placement of met buoys and other site characterization activities, including geophysical, geotechnical, biological, and oceanographic surveys.

These activities have the potential to impact the viewshed of coastal aboveground historic properties with open views in the direction of the WEAs. The physical presence of the temporary buoys (placed a minimum of 15 nm from shore) and increased boat traffic associated with surveys may fall within the viewshed of these properties. Potential impacts from buoys are addressed in the 2016 Programmatic Agreement regarding *Review of Outer Continental Shelf Renewable Energy Activities Offshore New Jersey and New York Under Section 106 of the NHPA*. In stipulation III-B of the Programmatic Agreement, stakeholder signatories agreed that the placement of met buoys should be exempt from Section 106 review. The Programmatic Agreement reasons that the buoys would have "no effect on onshore historic properties since they are temporary in nature and indistinguishable from lighted vessel traffic." This conclusion presented in the Programmatic Agreement demonstrates stakeholder concurrence that the placement of met buoys are expected to result in **negligible** impacts to aboveground historic properties. Potential increased vessel traffic associated with site characterization surveys also would be temporary in nature. These vessels would be indistinguishable from existing vessel traffic and only result in a nominal increase in vessel traffic over the 5- to 7-year span of activities. Because the vessel traffic would be both temporary and indistinguishable in nature, it is expected to have a **negligible** impact to aboveground historic properties.

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 submerged cultural resources by disturbing the bottom during search and retrieval. Regardless, the potential for recovery operations to interact with submerged cultural resources is extremely unlikely given the expanse of the proposed WEAs and transmission 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 if potential historic properties that have already been identified are avoided during retrieval, or, if geophysical data exists for the area, it could be reviewed to identify potential resources.

Conclusion

Overall, impacts to cultural, historical, and archaeological resources are expected to be **negligible**. Impacts to submerged historic properties from site characterization activities are expected to be **negligible** given the geophysical surveying requirements and lease conditions discussed above. Impacts to submerged historic properties from installation of a met buoys are expected to be **negligible**, as avoidance would likely be required by BOEM. If avoidance of potential historic properties is not feasible, BOEM will continue its Section 106 consultation (**Section 6.2.5**) to resolve adverse effects. Vessel traffic associated with the Proposed Action would be indistinguishable from existing vessel traffic and short-term. Therefore, impacts to onshore historic properties from site characterization activities are expected to be **negligible**.

B.3.3 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 3.3**, 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. 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 4.3.5**). 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.

Non-Routine Events

Non-routine events could affect recreation and tourism consist of the recovery of lost equipment through additional vessel traffic. Traffic associated with non-routine activities would likely be from a single vessel for a short duration and therefore are expected 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.

B.4 References

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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-1. Summary of annual emissions by activity

Action Alternative	Year	Activity/Year	Emissions (tons/year) CO	NOx	VOC	PM2.5	PM10	SOx	Emissions (metric tons/year) CO2	N2O	CH4	CO2e
			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: Biologic Surveys	7.44	89.24	3.38	4.72	4.87	0.01	4,231.99	0.12	0.55	4,282.34
B	Year 2	Site Characterization: HRG Surveys Site Characterization: Geotech and Benthic Surveys Site Characterization: Biologic Surveys Site Assessment: Meteorological Buoy Installations Site Assessment: Meteorological Buoy Operations	7.61	91.32	3.46	4.83	4.98	0.01	4,330.26	0.13	0.56	4,381.78
B	Year 3	Site Characterization: HRG Surveys Site Characterization: Geotech and Benthic Surveys Site Characterization: Biologic Surveys Site Assessment: Meteorological Buoy Operations	7.54	90.43	3.43	4.78	4.93	0.01	4,288.14	0.12	0.56	4,339.17
B	Year 4	Site Characterization: HRG Surveys Site Characterization: Geotech and Benthic Surveys Site Characterization: Biologic Surveys Site Assessment: Meteorological Buoy Operations	7.54	90.43	3.43	4.78	4.93	0.01	4,288.14	0.12	0.56	4,339.17
B	Year 5	Site Characterization: HRG Surveys Site Characterization: Geotech and Benthic Surveys Site Characterization: Biologic Surveys Site Assessment: Meteorological Buoy Operations	7.54	90.43	3.43	4.78	4.93	0.01	4,288.14	0.12	0.56	4,339.17
B	Year 6	Site Assessment: Meteorological Buoy Operations	0.10	1.18	0.04	0.06	0.06	0.00	56.15	0.00	0.01	56.82
B	Year 7	Site Assessment: Meteorological Buoy Decommissioning	0.07	0.89	0.03	0.05	0.05	0.00	42.11	0.00	0.01	42.62

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 www.boem.gov/renewable-energy/state-activities/lease-ocs-0512

Assumptions, data, table footnotes, and references—other than NY/NJ-specific lease area, port locations, vessel trip volumes, and distances—are taken from the NY 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

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

Emissions Summary for Average Year – Alternative B

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	2.91	34.89	1.32	1.85	1.90	0.00	1,654.49	0.05	0.22	1,674.17
Vessel Travel - Geotech and Benthic	1.36	16.34	0.62	0.86	0.89	0.00	774.98	0.02	0.10	784.20
Vessel Travel - Biologic	3.17	38.01	1.44	2.01	2.07	0.00	1,802.52	0.05	0.24	1,823.97
Site Characterization—Per Year from Years 1–5	**7.44**	**89.24**	**3.38**	**4.72**	**4.87**	**0.01**	**4,231.99**	**0.12**	**0.55**	**4,282.34**
Meteorological Buoys										
Site Assessment—Installation										
Vessel Travel	0.07	0.89	0.03	0.05	0.05	0.00	42.11	0.00	0.01	42.62
Site Assessment—Installation Year 2	**0.07**	**0.89**	**0.03**	**0.05**	**0.05**	**0.00**	**42.11**	**0.00**	**0.01**	**42.62**
Site Assessment—Offshore O&M										
Vessel Travel	0.10	1.18	0.04	0.06	0.06	0.00	56.15	0.00	0.01	56.82
Site Assessment—O&M Per Year from Years 2–6	**0.10**	**1.18**	**0.04**	**0.06**	**0.06**	**0.00**	**56.15**	**0.00**	**0.01**	**56.82**
Site Assessment—Offshore Decommission[1]										
Vessel Travel	0.07	0.89	0.03	0.05	0.05	0.00	42.11	0.00	0.01	42.62
SUBTOTAL Decommissioning - Year 7	**0.07**	**0.89**	**0.03**	**0.05**	**0.05**	**0.00**	**42.11**	**0.00**	**0.01**	**42.62**

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; SOx = sulfur oxides; VOC = volatile organic compounds

1. 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	Alternative B					
		Total No. of Vessel Round Trips	Duration of Survey Task (years)	No. of Vessel Round Trips (per year)[3]	Avg. Miles Per Round Trip (nautical miles)[4]	Total (nautical miles/year)[5]	Activity (hours/year)[6]
HRG Survey - Export Cable Routes	Crew Boat	-	5	-	-	8,785	1,952
HRG Survey - Total Backbone	Crew Boat	-	5	-	-	2,495	555
HRG Surveys - Lease Areas	Crew Boat	-	5	-	-	17,951	3,989
Geotechnical Sampling[1]	Small Tug Boat	-	5	-	-	19,434	1,620
Avian Surveys[2,7]	Crew Boat	360	5	72	130	9,330	933
Fish Surveys[7]	Crew Boat	-	5	-	-	19,046	6,144
Marine Mammal Surveys[8]	Crew Boat	-	-	-	-	-	-

HRG = high-resolution geophysical

1. 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
   Assumes 12 megawatt turbines resulting in 816 total turbines for the lease areas
2. Assumes all avian surveys completed by boat to obtain worst-case scenario
3. Round trips per year estimated by dividing total round trips per task by the number of years over which the surveys would be conducted
4. Average miles per round trip was calculated by averaging the round trip to the centroid of each lease area from the nearest of the potential staging ports identified within the environmental assessment
5. Distances for HRG survey and HRG survey cable routes are based on vessel-hours and speed. Distances for other surveys based on calculated round trips multiplied by average round trip nautical miles
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)

   No time for the vessels spent at idle was captured in this calculation
7. Avian surveys are 3 years/lease area Fish surveys are 2 years/lease area
   Assumes avian and fish surveys occur over 5 years over all lease areas
8. Assumes marine mammal/sea turtle survey conducted concurrent with vessel-based surveys

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]	Load Factor (%)[2]	Emission Factors (g/kW-hr)[3]								
				CO	NO_x	VOC	$PM_{2.5}$[4]	PM_{10}	SO_x[5]	CO_2	N_2O	CH_4
Crew Boat	1,000	746	45%	1.1	13.2	0.5	0.70	0.72	0.001	690	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 factor based upon Table 3.4 of *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories*, U.S. EPA, April 2009
   Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors are for Harbor Vessels
3. Emission factors were provided in the *Current Methodologies* document, Table 3-8. 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
4. Assumes PM2.5 = 97% PM10 based upon the Current Methodologies document
5. SOx emission factor estimated based on sulfur content of 15 ppm and the *Current Methodologies* document

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]
Alternative B	Crew Boat - Export Cable Routes	0.87	10.49	0.40	0.55	0.57	0.00	497.25	0.01	0.06	503.17
	Crew Boat - Backbone	0.25	2.98	0.11	0.16	0.16	0.00	141.24	0.00	0.02	142.92
	Crew Boat - Lease Area	1.79	21.43	0.81	1.13	1.17	0.00	1,016.00	0.03	0.13	1,028.09
	TOTAL	**2.91**	**34.89**	**1.32**	**1.85**	**1.90**	**0.00**	**1,654.49**	**0.05**	**0.22**	**1,674.17**

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. 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 crew boat to account for auxiliary engines based upon Table 3.10 of the *Current Methodologies* 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	$PM_{2.5}$[4]	PM_{10}	SO_x[5]	CO_2	N_2O	CH_4
Small Tug Boat	2,000	1,491	31%	1.1	13.2	0.5	0.70	0.72	0.001	690	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 factor based upon Table 3.4 of *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories*, U.S. EPA, April 2009
   Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors are for Harbor Vessels
3. Emission factors were provided in the *Current Methodologies* document, Table 3-8. Tier 0, Category 2 (typically between 1,000 and 3,000 kW) factors were used for the tug boat
4. Assumes $PM_{2.5}$ = 97% PM_{10} based upon the Current Methodologies document
5. SOx emission factor estimated based on sulfur content of 15 ppm and the *Current Methodologies* document

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]
B	Small Tug Boat	1.36	16.34	0.62	0.86	0.89	0.00	774.98	0.02	0.10	784.20
	TOTAL	**1.36**	**16.34**	**0.62**	**0.86**	**0.89**	**0.00**	**774.98**	**0.02**	**0.10**	**784.20**

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. 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 crew boat to account for auxiliary engines based upon Table 3.10 of the *Current Methodologies* 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]	Emission Factors (g/kW-hr)[3]									
			Load Factor (%)[2]	CO	NO_x	VOC	$PM_{2.5}$[4]	PM_{10}	SO_x[5]	CO_2	N_2O	CH_4
Crew Boat	1,000	746	45%	1.1	13.2	0.5	0.70	0.72	0.001	690	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 factor based upon Table 3.4 of *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories*, U.S. EPA, April 2009
   Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors are for Harbor Vessels
3. Emission factors were provided in the *Current Methodologies* document, Table 3-8. 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
4. Assumes $PM_{2.5}$ = 97% PM_{10} based upon the Current Methodologies document
5. SOx emission factor estimated based on sulfur content of 15 ppm and the *Current Methodologies* document

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}[4]
Alternative B	Crew Boat - Avian Surveys	0.42	5.01	0.19	0.27	0.27	0.00	237.65	0.01	0.03	240.47
	Crew Boat - Fish Surveys	2.75	33.00	1.25	1.75	1.80	0.00	1,564.87	0.05	0.20	1,583.49
	Crew Boat - Marine Mammals Survey[3]	-	-	-	-	-	-	-	-	-	-
	TOTAL	**3.17**	**38.01**	**1.44**	**2.01**	**2.07**	**0.00**	**1,802.52**	**0.05**	**0.24**	**1,823.97**

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. 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 crew boat to account for auxiliary engines based upon Table 3.10 of the *Current Methodologies* document
3. Assumes marine mammal surveys conducted concurrent with vessel-based surveys
4. 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 No. of Vessel Round Trips/Year[1]	Avg. Miles Per Round Trip (nautical miles)	Total (nautical miles/year)	Activity (hours/year)[2]
Crew Boat	20	99	1,984	165

1. Assumes 1 trip/buoy, 2 buoys/lease area, 10 lease areas
2. Assumes an average speed of 12 knots for the crew boat
   Activity hours based upon total nautical miles traveled
   No time for the vessels spent at idle at the buoys was captured in this calculation

Vessel Details for Operation and Maintenance of Buoys

Vessel Type	Total No. of Vessel Round Trips/Year[1]	Avg. Miles Per Round Trip (nautical miles)	Total (nautical miles/year)	Activity (hours/year)[2]
Crew Boat	40	99	3,968	220

1. Assumes 1 trip/buoy pair, 4 times per year, 10 lease areas
2. Assumes an average speed of 18 knots for the crew boat
   Activity hours based upon total nautical miles traveled
   No time for the vessels spent at idle at the buoys was captured in this calculation
   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)[1]	Load Factor (%)[2]	Emission Factors (g/kW-hr)[3]								
				CO	NO_x	VOC	$PM_{2.5}$[4]	PM_{10}	SO_x[5]	CO_2	N_2O	CH_4
Crew Boat	1,000	746	45%	1.1	13.2	0.5	0.70	0.72	0.001	690	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 similar emission factors to crew boat as listed in same category in *Current Methodologies*
2. Engine power (kW) estimated by dividing horsepower by a factor of 1.341
3. Load factor based upon Table 3.4 of *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories*, U.S. EPA, April 2009
   Table 3-1 describes crew boats as Harbor Vessels; therefore, the load factor is for Harbor Vessels
4. Emission factors were provided in the *Current Methodologies* document, Table 3-8. Tier 0, Category 2 (typically between 1,000 and 3,000 kW) factors were used for the crew boat since it is almost within that category, and it provides a conservative assumption for pollutants for which the areas are in non-attainment
5. Assumes $PM_{2.5}$ = 97% PM_{10} based upon the Current Methodologies document
6. SOx emission factor estimated based on sulfur content of 15 ppm and the *Current Methodologies* document

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	0.07	0.89	0.03	0.05	0.05	0.00	42.11	0.00	0.01	42.62
TOTAL	**0.07**	**0.89**	**0.03**	**0.05**	**0.05**	**0.00**	**42.11**	**0.00**	**0.01**	**42.62**

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. 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 crew boat to account for auxiliary engines based upon Table 3.10 of the *Current Methodologies* 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

Maintenance Vessel Details

Task	Vessel Type	Total No. of Vessel Round Trips	Duration of Task (years)	No. of Vessel Round Trips (per year)	Avg. Miles Per Round Trip (nautical miles)	Total (nautical miles/year)	Activity (hours/year)
Routine Maintenance	Crew Boat	200	5	40	99	3,968	220

1. Assumes 1 trip/buoy, 2 buoys/lease area, 10 lease areas
2. Assumes an average speed of 12 knots for the crew boat
   Activity hours based upon total nautical miles traveled
   No time for the vessels spent at idle at the buoys was captured in this calculation

Emission Factors for Vessels

			Emission Factors (g/kW-hr)[3]									
Vessel Type	Engine Size (hp)	Engine Power (kW)[1]	Load Factor (%)[2]	CO	NO_x	VOC	$PM_{2.5}$[4]	PM_{10}	SO_x[5]	CO_2	N_2O	CH_4
Crew Boat	1,000	746	45%	1.1	13.2	0.5	0.70	0.72	0.001	690.0	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 factor based upon Table 3.4 of *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories*, U.S. EPA, April 2009
   Table 3-1 describes crew boats as Harbor Vessels; therefore, the load factor is for Harbor Vessels
3. Emission factors were provided in the *Current Methodologies* document, Table 3-8. Tier 0, Category 2 (typically between 1,000 and 3,000 kW) factors were used for the crew boat since it is almost within that category, and it provides a conservative assumption for pollutants for which the areas are in non-attainment
4. Assumes $PM_{2.5}$ = 97% PM_{10} based upon the Current Methodologies document
5. SOx emission factor estimated based on sulfur content of 15 ppm and the *Current Methodologies* document

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	0.10	1.18	0.04	0.06	0.06	0.00	56.15	0.00	0.01	56.82
TOTAL	**0.10**	**1.18**	**0.04**	**0.06**	**0.06**	**0.00**	**56.15**	**0.00**	**0.01**	**56.82**

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 crew boat to account for auxiliary engines based upon Table 3.10 of the *Current Methodologies* document
3. Global Warming Potential CO_2 1 N_2O 298 CH_4 25 USEPA 40 CFR 98 Table A-1 (5/19)

Appendix D: Planned Action Scenario

D.1 Introduction

This appendix discusses resource-specific ongoing and reasonably foreseeable planned actions that could occur if impacts from the Proposed Action 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 New York (NY) Bight (defined as an offshore area extending generally northeast from Cape May in New Jersey [NJ] to Montauk Point on the eastern tip of Long Island), 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 NY Bight proposed lease areas (e.g., water quality). This scope includes potential activities that would occur on the Atlantic OCS offshore NY and NJ, as well as activities that would take place in state waters (**Figure 1** of the EA). However, the geographic boundaries for the analysis for marine mammals, sea turtles, fish/fishing, and birds include the entire NY Bight and some waters offshore Rhode Island and Massachusetts to the north and Delaware to the south given their migratory nature (**Figure D-1**). 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 southwestern corner of the Hudson South WEA to Cape May, NJ, and as far north as a line drawn between the northeastern corner of the Fairways North WEA to the eastern edge of Narragansett Bay. 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 from 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 2022 and the completion of decommissioning in 2027 or 2028, depending on when the leases are issued.

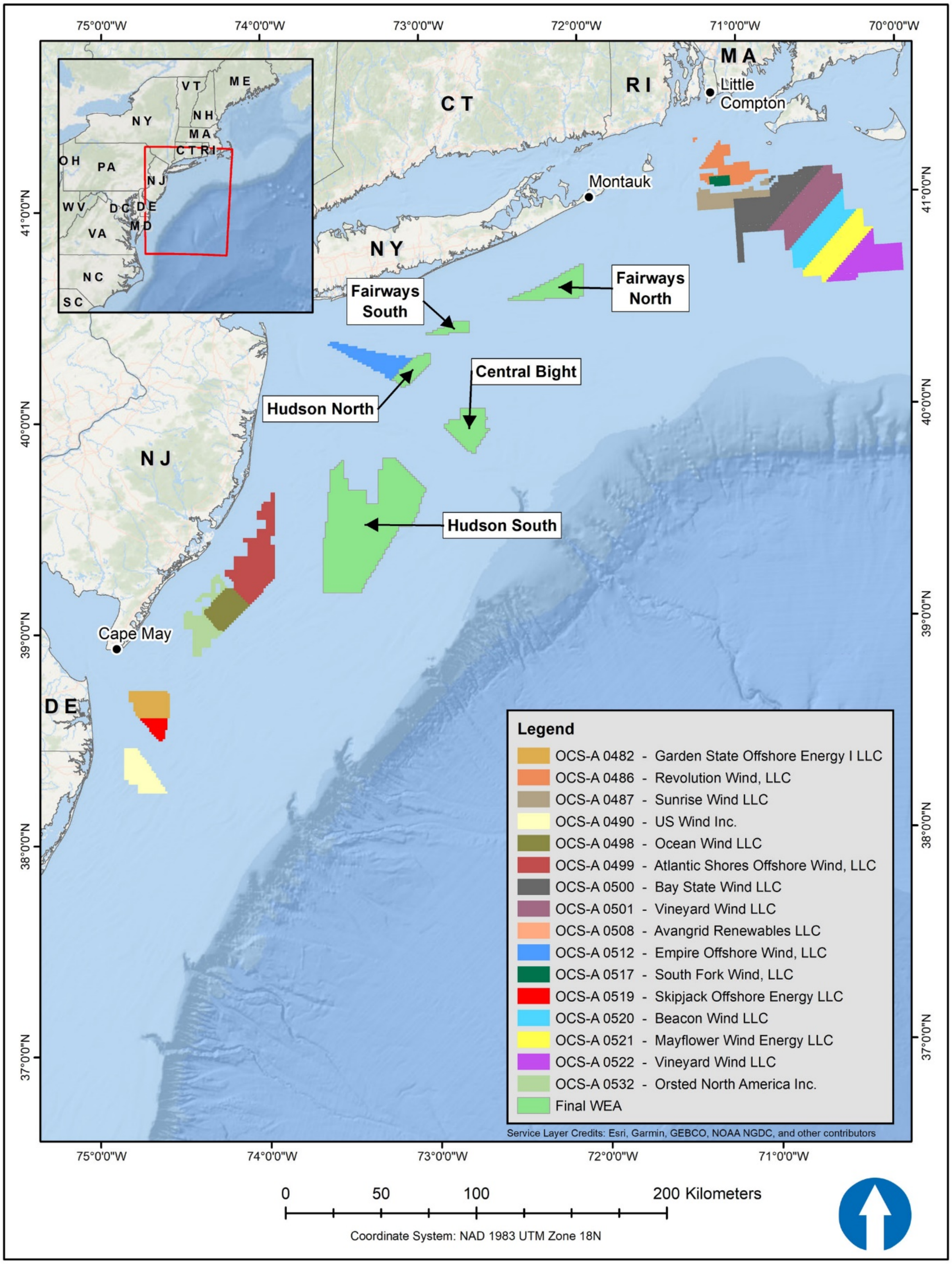

Figure D-1. New York Bight Wind Energy Areas (WEAs) shown with the geographic analysis area considered for migratory species along with other wind energy development activities

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.

BOEM has completed a study of IPFs on the North Atlantic OCS to consider in an offshore wind development impacts scenario for ongoing and reasonably foreseeable planned actions (BOEM 2019). 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. Other documents that provide additional information on planned actions in the region include the 2016 New York Environmental Assessment (EA) (BOEM Office of Renewable Energy Programs [OREP] 2016), the South Fork Wind Farm and South Fork Export Cable Project Draft Environmental Impact Statement (EIS) (BOEM OREP 2021c) and the Vineyard Wind 1 Offshore Wind Energy Project Final EIS (BOEM OREP 2021d). However, the South Fork and Vineyard Wind EIS documents consider projects much larger in scope than the Proposed Action.

IPFs associated with the Proposed Action include:

- Increased vessel presence and traffic resulting in associated noise, air emissions, lighting, vessel discharges, and the potential for strikes and spills; 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 meteorological buoys, geotechnical/sub-bottom 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 nine 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 nine 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 (2022–2027/2028). **Table D-1** provides a list of these Atlantic offshore wind development projects, which are also shown in **Figure D-1**.

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
NE	n/a	Aquaventis (state waters)	State project	2022
NE	n/a	Block Island (state waters)	Built	Built
MA/RI	OCS-A 0501	Vineyard Wind 1, part of OCS-A 0501	FEIS, ROD	2022–2024
MA/RI	OCS-A 0501	Vineyard Wind South OCS-A 0501 remainder (includes Park City Wind)	COP, PPA	2024–2025
MA/RI	OCS-A 0517	South Fork, part of OCS-A 0517	COP, PPA	2022–2023
MA/RI	OCS-A 0500 and OCS-A 0487	Sunrise, parts of OCS-A 0500 and OCS-A 0487	COP, PPA	2023–2024
MA/RI	OCS-A 0500	Bay State Wind Project, part of OCS-A 0500	COP (unpublished)	By 2030, spread over 2025–2030
MA/RI	OCS-A 0486	Revolution Wind, part of OCS-A 0486	COP, PPA	2023–2024
MA/RI	OCS-A 0521	Mayflower (North), part of OCS-A 0521	PPA	2024–2025
MA/RI	OCS-A 0521	OCS-A 0521 remainder	--	By 2030, spread over 2025–2030
MA/RI	OCS-A 0520	Beacon Wind	--	By 2030, spread over 2025–2030
MA/RI	OCS-A 0522	Liberty Wind, part of OCS-A 0522	--	By 2030, spread over 2025–2030
MA/RI	OCS-A 0522	OCS-A 0522 remainder	--	By 2030, spread over 2025–2030
NY/NJ	OCS-A 0498	Ocean Wind, part of OCS-A 0498	COP, PPA	2022–2023
NY/NJ	OCS-A 0498	OCS-A 0498 remainder	--	By 2030, spread over 2024–2030
NY/NJ	OCS-A 0512	Empire Wind, part of OCS-A 0512	COP, PPA	2023–2024
NY/NJ	OCS-A 0512	Empire Wind Phase 2 and 3, part of OCS-A 0512	--	By 2030, spread over 2024–2030
NY/NJ	OCS-A 0499	Atlantic Shores OCS-A 0499	--	By 2030, spread over 2024–2030
DE/MD	OCS-A 0519	Skipjack, part of OCS-A 0519	COP, PPA	2022–2023
DE/MD	OCS-A 0519	OCS-A 0519 remainder	--	By 2030, spread over 2023–2030
DE/MD	OCS-A 0490	US Wind, Inc.	COP, PPA	2022–2023
DE/MD	OCS-A 0482	Garden State Offshore Energy I,LLC	--	By 2030, spread over 2023–2030

State	Lease Number	Company Name	Description	Estimated Site Characterization Survey Schedule
MA/RI	OCS-A 0486	Revolution Wind	One met buoy; deployed 1/17/2019	2019–2023
MA/RI	OCS-A 0501	Vineyard Wind LLC	Two met buoys	2018–2022
MA/RI	OCS-A 0520	Beacon Wind	--	2020–2024
MA/RI	OCS-A 0521	Mayflower Wind	One met buoy	2020–2024
MA/RI	OCS-A 0522	Vineyard Wind LLC	Two met buoys	2020–2024
NJ	OCS-A 0498	Ocean Wind LLC	Two met buoys, onemet/current buoy; installed 8/20/2018	2018–2022
NY	OCS-A 0512	Empire Wind	Two met buoys, one wave/met buoy, and one subsea current meter mooring	2019–2023
DE	OCS-A 0482	Garden State Offshore Energy I,LLC	One met buoy; deployed 1/20/2020	2020–2024
MD	OCS-A 0490	US Wind, Inc.	One met tower, seabed mountainsensors	2018–2022

-- = to be determined; COP = Construction and Operations Plan; DE = Delaware; FEIS = Final Environmental Impact Statement; MA = Massachusetts; MD = Maryland; met = meteorological; n/a = not applicable; NE = New England; NJ = New Jersey; NY = New York; OCS = Outer Continental Shelf; PPA=Power Purchase Agreement; RI = Rhode Island; ROD = Record of Decision.

D.2.2 Hydrokinetic Projects

The following tidal energy project has been developed in the geographic analysis area and is in operation:

- The Roosevelt Island Tidal Energy (RITE) Project located in the East Channel of the East River, a tidal strait connecting the Long Island Sound with the Atlantic Ocean in the New York Harbor. In 2005, Verdant Power petitioned Federal Energy Regulatory Commission (FERC) for permission to the first U.S. commercial license for tidal power. In 2012, FERC issued a 10-year license to install up to 1 MW of power (30 turbines/10 TriFrames) at the RITE project. On October 22, 2020, Verdant Power installed three Gen5 Free Flow System Turbines on a TriFrame™ mount at the RITE Project (Verdant Power 2021a; 2021b).

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 NY and NJ coastlines and additional cables are planned, such as Google’s Grace Hopper Cable System slated to be completed in 2022 (Koley 2020). Although no other cable systems were identified, BOEM anticipates that other projects could overlap with the Proposed Action within the NY Bight over the lifespan considered in the EA.

Additionally, the offshore wind projects listed **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 no active leases for sand borrow areas offshore NY or NJ (BOEM 2021a). However, 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). The study indicated that no projects have been listed in NY that are likely to use OCS resources over the next 10 years, but there are seven projects in NJ that are expected to need OCS leases in the next 10 years. This finding makes it likely that lease requests will occur, and active leases are possible over the lifespan considered in the EA.

The U.S. Environmental Protection Agency (EPA) Region 2 is responsible for designating and managing ocean disposal sites for materials offshore in the region of the proposed lease area. U.S. Army Corps of Engineers (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 NY and NJ that are no longer used for disposal and one active site (the Historic Area Remediation Site) located closer to shore than the proposed lease areas (EPA 2021).

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 NY and NJ. USCG has a Weapons Training Area in the northern portion of the Hudson South Call Area (BOEM 2021b).

D.2.6 Marine Transportation

The number of one-way vessel trips associated with shipping in the WEA area was reported to be 30,768 domestic and foreign vessel trips in the lower entrance channels of NY Harbor, NY, and 5,115 vessel trips in Newark Bay, NJ, in 2014 (a total of 35,883 one-way trips) (USACE 2014). 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 NY and NJ, 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 two of NMFS’ eight regional councils to manage Federal fisheries based on the fishery being considered: Mid-Atlantic Fisheries Management Council (MAFMC), which includes NY, NJ, Pennsylvania, Delaware, Maryland, Virginia and North Carolina; and New England Fishery Management Council (NEFMC), which includes Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut. For example, the NEFMC manages the Atlantic sea scallop fishery, while the MAFMC manages the surf clam and ocean quahog fisheries. The councils manage species with many fishery management plans, which are frequently updated, revised, and amended and coordinate 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. They accomplish this 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 Northeast and the Mid-Atlantic regions. 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

The Programmatic EIS for Alternative Energy Development and Production and Alternate Use of Activities on the Outer Continental Shelf (Minerals Management Service 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 as 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°C and also compared these to an increase of 2°C. 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 to terrestrial ecosystems; impacts to marine biodiversity, fisheries, and ecosystems and their functions and services to humans; and impacts to health, livelihoods, food security, water supply, and economic growth (IPCC 2019).

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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
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) within U.S. waters. The Mid-Atlantic Fishery Management Council (MAFMC) and New England Fishery Management Council (NEFMC) prepare FMPs covering the New York Bight (NY Bight). 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 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 "any 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 March 29, 2021, the Bureau of Ocean Energy Management (BOEM) released the Announcement of Area Identification (Area ID) (BOEM 2021). The Area ID Memorandum documents the analysis and rationale used to develop the WEAs in the NY Bight.

The purpose of the Proposed Action is to assess the physical characteristics of areas on the Outer Continental Shelf (OCS) of the NY Bight through the issuance of commercial and research leases within the WEAs and granting of rights-of-way (ROWs) and rights-of-use and easement (RUEs) in the region (the project area). BOEM's issuance of these leases and grants is needed (a) to 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 development plans for BOEM's review; and (b) to ensure that site characterization and assessment activities are conducted in a safe and environmentally responsible manner.

Based on the process described in the Area ID Memorandum (BOEM 2021), the WEAs considered in this assessment are described in **Table E-1** and depicted in **Figure E-1**.

Table E-1. New York Bight Wind Energy Areas (WEAs) descriptive statistics

Parameter	Fairways North WEA	Fairways South WEA	Hudson North WEA	Central Bight WEA	Hudson South WEA	Total
Acres	88,246	23,841	43,056	84,688	567,552	807,383
Maximum depth (m)	56	46	45	61	59	--
Minimum depth (m)	42	39	41	52	32	--
Closest distance to New York (nm)	15	15	21	38	45	--
Closest distance to New Jersey (nm)	69	45	36	53	23	--

-- = not applicable.

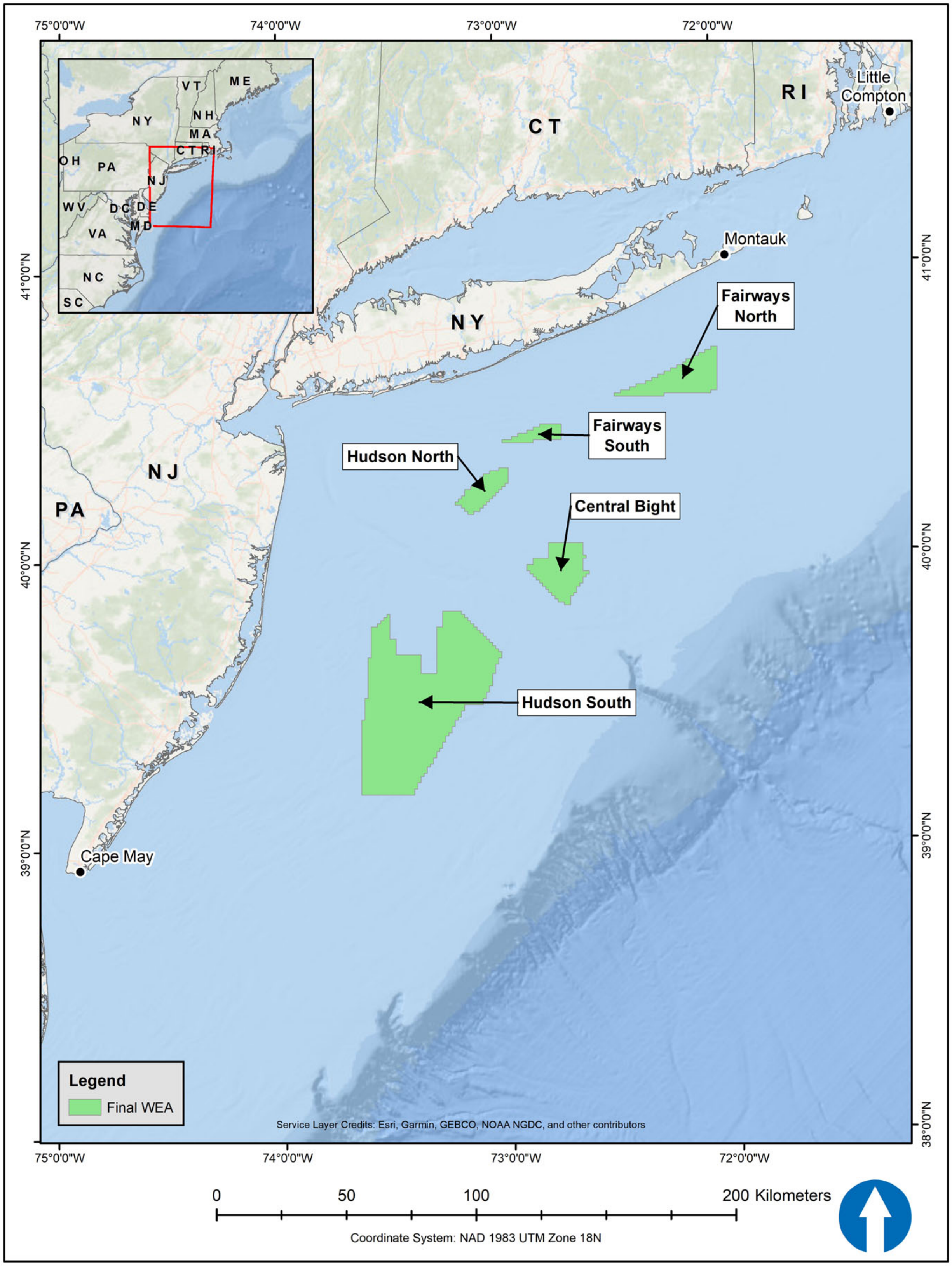

Figure E-1. New York Bight Wind Energy Areas (WEAs)

The Proposed Action for this assessment is the issuance of commercial and research wind energy leases within the WEAs that BOEM has designated on the OCS in the NY Bight, and the granting ROWs and RUEs in support of wind energy development. This assessment analyzes BOEM's issuance of up to 10 leases that may cover the entirety of the WEAs, the issuance of potential project 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 project easements would all be located within the NY Bight, 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 project easements. Site assessment activities would most likely include the temporary placement of meteorological and oceanographic buoys (i.e., met buoys). Site characterization activities would most likely include geophysical and geotechnical, and biological surveys as described in **Tables E-2**, **E-3**, and **E-4**.

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 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 sub-bottom 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 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 sub-bottom profiler systems), BOEM recommends surveying at a 30-m line spacing.
Shallow and medium (seismic) penetration sub-bottom profilers	Collection of geophysical data for shallow hazards and archaeological resources assessments and to characterize subsurface sediments	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.	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 sub-bottom profiler systems), BOEM recommends surveying at a 30-m line spacing.

BOEM = Bureau of Ocean Energy Management; CHIRP = Compressed High-Intensity Radiated Pulse; 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 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 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	Supplement or use 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; CPT = cone penetration test; dB = decibels; HRG = high-resolution geophysical; 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	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
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

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, BOEM would issue leases as early as late 2021 and continue through late 2022. It is assumed lessees would begin survey activities as soon as possible after receiving a lease, after preparing a Site Assessment Plan and 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 late 2021, the earliest surveys would likely begin no sooner than April 2022. 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 late 2022, those lessees' surveys would continue through August 2027 prior to submitting their COPs.

E.3 EFH Presence Within the WEAs

In this section, fish and invertebrate resources expected for the NY Bight WEAs are characterized using broad ecological/habitat categories: soft bottom, hardbottom, and pelagic. These habitat categories are described and further characterized for offshore, nearshore, and inshore areas when possible. 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 Mid- Atlantic Bight and southern New England may be found in NEFMC (2016; 2017) and BOEM (2014).

Species composition in the NY Bight 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).

For this assessment, we 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 2021). This data source provided geographical distribution of various life stages of managed species as well as links to 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), NEFMC and NMFS (2017), and NYSERDA (2017).

The area of interest includes EFH by life stage for 48 managed species, including 5 invertebrate taxa (**Table E-5**), 17 elasmobranch species (sharks, rays, and skates; **Table E-6**), and 26 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**).

Eggs and adults of offshore squid occur along the edge of continental shelf outside of the project area (**Table E-5**). Information on neonate (newborn) EFH for several shark species (e.g., basking shark, shortfin mako, bigeye thresher) is lacking for the project area, but EFH is present for neonate/juvenile sandbar shark, sand tiger shark, blue shark, dusky shark, and spiny dogfish (**Table E-6**). Skates deposit eggs on the seafloor in the project area, although little is known about habitat preferences of 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 20 of the 26 bony fish species listed in **Table E-7** are present in the project area. Only adult and juvenile EFH for bigeye tuna, yellowfin tuna, skipjack tuna, albacore tuna, and swordfish are documented for the project area (**Table E-7**). Most of the bony fish species have pelagic eggs and larvae. Atlantic salmon, ocean pout, and winter flounder have demersal eggs. EFH for ocean pout and winter flounder eggs occurs in the project area, but Atlantic salmon deposit their eggs in the freshwater reaches of coastal rivers well outside of the project area (**Table E-7**).

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 to 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 New Jersey and New York including Baltimore, Wilmington, Toms, Middle Toms, Hendrickson, and Hudson 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 Great Bay (New Jersey); (3) inshore of the 20-m isobath for juvenile Atlantic cod in Narragansett Bay, Block Island, and Block Island Sound (Rhode Island); and (4) summer flounder (*Paralichthys dentatus*) submerged aquatic vegetation (SAV) nursery areas in all estuaries of the region including Narragansett Bay, Long Island Sound, and Delaware Bay. The map of HAPCs specific to individual species (**Figure E-2**) show 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, juvenile cod, 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 (39º11'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, DE).
- **Sandbar shark:** Constitutes important nursery and pupping grounds—which have been identified in shallow areas and at the mouth of Great Bay, NJ; in lower and middle Delaware Bay, DE; lower Chesapeake Bay, MD; and offshore of the Outer Banks, NC—in water temperatures ranging from 15 to 30°C; salinities at least from 15 to 35 ppt; water depths ranging from 0.8 to 23 m; and sand and mud habitats (NEFMC 2017).
- **Inshore of the 20-m isobath for juvenile Atlantic cod:** Inshore areas of the Gulf of Maine and Southern New England between 0 to 20 m (relative to mean high water) with high benthic productivity and hardbottom habitats, which provide structured benthic habitat and food resources for cod and other demersal managed species.
- **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 (https://www.habitat.noaa.gov/protection/efh/efhmapper/). Note that summer flounder SAV nursery area has not been formally mapped and therefore is not included in **Figure E-2**.

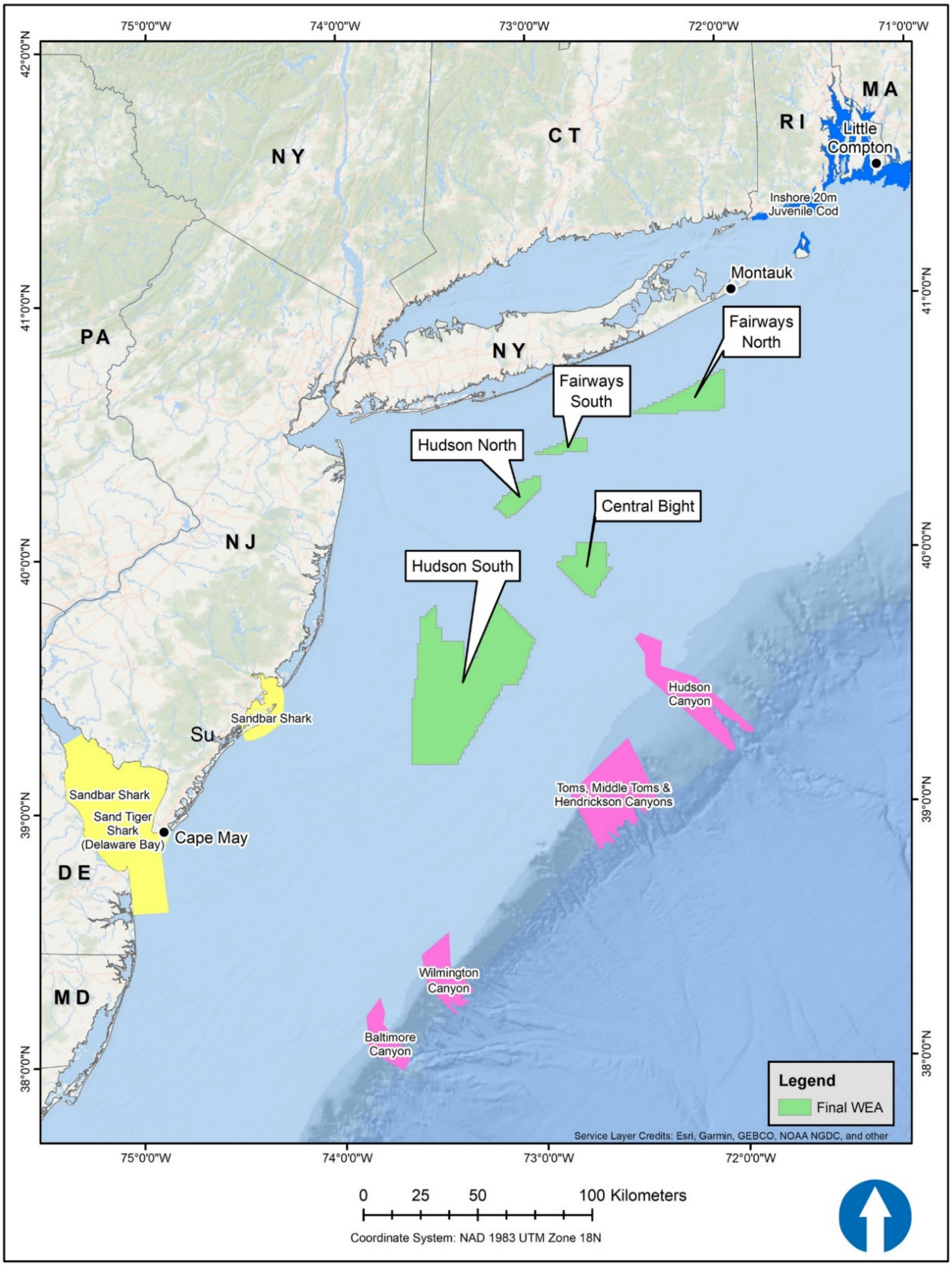

Figure E-2. Habitat Areas of Particular Concern (HAPCs) and in the vicinity of the New York Bight Wind Energy Areas (WEAs).

HAPCs shown in pink (canyons), yellow (sharks), and blue (Atlantic cod). Note that the summer flounder HAPC is not shown as the data is not currently available.

Table E-5. Invertebrate species with Essential Fish Habitat (EFH) identified in the vicinity of the New York Bight
(MAFMC 1998b; 1998c; NEFMC 2017)

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 hard bottom 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 6–160 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, NC, 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, NC, from shore to 183 m water depths in temperatures ranging between 3.8 and 19°C.

Table F-5. (Continued)

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

EEZ = Exclusive Economic Zone; MAFMC = Mid-Atlantic Fishery Management Council; N/A = not applicable; NMFS = National Marine Fisheries Service.

Table E-6. Shark and skate species and life stages with Essential Fish Habitat (EFH) identified within the project area (MAFMC 2014; NMFS 2017)

Species	Neonate/ Early Juveniles	Late Juveniles/ Subadults	Adults
Basking shark (*Cetorhinus maximus*)	N/A	N/A	Atlantic East Coast from the Gulf of Maine to the northern Outer Banks of North Carolina, and from mid-South Carolina to coastal areas of northeast Florida. Aggregations of basking sharks were observed from the south and southeast of Long Island; east of Cape Cod; and along the coast of Maine, in the Gulf of Maine and near the Great South Channel, approximately 95 km southeast of Cape Cod, MA, as well as approximately 75 km south of Martha's Vineyard and 90 km south of Moriche's Inlet, Long Island. These aggregations tend to be associated with persistent thermal fronts within areas of high prey density.
Common thresher shark (*Alopias vulpinus*)	N/A	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, NC; and from Maine to locations offshore of Cape Ann, MA.	N/A
Bigeye thresher shark (*Alopias superciliosus*)	N/A	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 offshore pelagic habitats seaward of the continental shelf break between the seaward extent of the U.S. EEZ boundary on Georges Bank (off Massachusetts) to Georgia.	N/A

Table F-6. (Continued)

Species	Neonate/ Early Juveniles	Late Juveniles/ Subadults	Adults
Longfin mako (*Isurus paucus*)	N/A	EFH in the Atlantic Ocean occurs seaward of the 200-m depth contour between Cape Cod, MA, and Cape Hatteras, NC; and the Blake Plateau off Georgia and Florida.	N/A
Shortfin mako *(Isurus oxyrinchus)*	N/A	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 (off Massachusetts) to Cape Cod (seaward of the 200-m bathymetric line).	N/A
White shark (*Carcharodon carcharias*)	EFH includes inshore waters out to 105 km from Cape Cod, MA, to an area offshore of Ocean City, NJ.	EFH includes inshore waters to habitats 105 km from shore, in water temperatures ranging from 9–28°C, but more commonly found in water temperatures from 14–23°C from Cape Ann, MA, including parts of the Gulf of Maine, to Long Island, NY, and from Jacksonville to Cape Canaveral, FL.	See juveniles
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 parts per thousand (ppt), 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.

Table F-6. (Continued)

Species	Neonate/ Early Juveniles	Late Juveniles/ Subadults	Adults
Sandbar shark (*Carcharhinus plumbeus)*	Atlantic coastal areas from Long Island, NY, to Cape Lookout, NC. Important neonate/young-of-the-year EFH includes: Delaware Bay (DE and NJ) and Chesapeake Bay (VA and MD), 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, NJ. 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, MA) and Georgia in water temperatures ranging from 20–24°C and depths from 2.4–6.4 m. Important nurseries include Delaware Bay, DE and NJ; Chesapeake Bay, VA; Great Bay, NJ; and the waters off Cape Hatteras, NC. 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.

Table F-6. (Continued)

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, NC. 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 juveniles
Tiger shark (*Gaelocerdo cuvier*)	EFH in the Atlantic Ocean includes coastal areas from the North Carolina/Virginia border to the Florida Keys.	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 juveniles
Blue shark (*Prionace glauca*)	In the Atlantic in areas offshore of Cape Cod through New Jersey, seaward of the 30-m bathymetric line (and excluding inshore waters such as Long Island Sound). EFH follows the continental shelf south of Georges Bank to the outer extent of the U.S. EEZ in the Gulf of Maine.	Localized areas in the Atlantic Ocean in the Gulf of Maine, from Georges Bank to North Carolina, South Carolina, Georgia, and off Florida.	See juveniles

Table F-6. (Continued)

Species	Neonate/ Early Juveniles	Late Juveniles/ Subadults	Adults
Spiny dogfish (*Squalus acanthias*)	Pelagic and epibenthic habitats, primarily in deep water on the OCS and slope between Cape Hatteras and Georges Bank and in the Gulf of Maine. Young are born mostly on the offshore wintering grounds from November to January, but newborns (neonates or "pups") are sometimes taken in the Gulf of Maine or southern New England in early summer.	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 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.
Barndoor skate (*Dipturus laevis*)	N/A	EFH for juvenile and adult barndoor skates occurs on mud, sand, and gravel substrates. Both life stages are usually found on the continental shelf in depths less than 160 m, but the adults also occupy benthic habitats between 300 and 400 m on the outer shelf.	See juveniles
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.
Rosette skate (*Leucoraja garmani*)	N/A	Benthic habitats with mud and sand substrates on the OCS in depths of 80–400 m from approximately 40°N latitude to Cape Hatteras, NC.	See juveniles

EEZ = Exclusive Economic Zone; MAFMC = Mid-Atlantic Fishery Management Council; N/A = not applicable; NMFS = National Marine Fisheries Service.

Table E-7. Bony fish species by life stages with Essential Fish Habitat (EFH) identified within project area
(MAFMC 1998c; 1998d; 2011; 2014; NEFMC 2017; NMFS 2017)

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. Young-of-the-year (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.	Sub-tidal benthic habitats in depths of 50–400 m in southern New England and Georges Bank, between 20–400 m in the Gulf of Maine, and to a maximum depth of 1,000 m on the continental slope. EFH for adult monkfish is composed of hard sand, pebbles, gravel, broken shells, and soft mud. They seem to prefer soft sediments (fine sand and mud) over sand and gravel, and, like juveniles, utilize the edges of rocky areas for feeding.

Table F-7. (Continued)

Species	Eggs and Larvae	Juveniles/Subadults	Adults
Atlantic herring (*Clupea harengus*)	**Eggs:** Inshore and offshore benthic habitats in the Gulf of Maine and on Georges Bank and Nantucket Shoals in depths of 5–90 m on coarse sand, pebbles, cobbles, and boulders and/or macroalgae. Eggs adhere to the bottom, often in areas with strong bottom currents, forming egg "beds" that may be many layers deep**. Larvae:** Inshore and offshore pelagic habitats in the Gulf of Maine, on Georges Bank, and in the upper Mid-Atlantic Bight, in the bays and estuaries. Atlantic herring have a very long larval stage, lasting 4–8 months, and are transported long distances to inshore and estuarine waters where they metamorphose into early-stage juveniles ("brit") in the spring.	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).
Atlantic salmon (*Salmo salar*)	Not present in project area	Juveniles begin metamorphosis into smolts while still in fresh water, in preparation for downstream migration into brackish and fully saline seawater in the spring. The timing of downstream migration depends on a variety of factors, including temperature, salinity, and the physiological adaptations that make it possible for the smolts to tolerate higher salinity.	EFH for spawning adult salmon also includes coastal marine, estuarine, lacustrine, and riverine habitats used during upstream migration.

Table F-7. (Continued)

Species	Eggs and Larvae	Juveniles/Subadults	Adults
Scup (*Stenotomus chrysops*)	**Eggs**: EFH for scup eggs is "mixing" and "seawater" salinity zones of estuaries. In general, scup eggs are found from May through August in southern New England to coastal Virginia, in waters between 13 and 23°C, and in salinities greater than 15 ppt. **Larvae**: Scup larvae are most abundant nearshore from May through September in waters between 13 and 23°C and in salinities greater than 15 ppt.	**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, NC. **Inshore:** EFH includes "mixing" and "seawater" salinity zones of estuaries. In general during the summer and sprin,g 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.	**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, NC. **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 sea bass 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, NC. 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, NC. **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 sea bass 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 sea bass are usually found in association with rough bottom, shellfish, and eelgrass bed,s and man-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, NC. **Inshore:** EFH is estuaries. Black sea bass 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 man-made), sand, and shell are usually the substrate preference.

Table F-7. (Continued)

Species	Eggs and Larvae	Juveniles/Subadults	Adults
American plaice (*Hippoglossoides platessoides*)	**Eggs:** Pelagic habitats in the Gulf of Maine and on Georges Bank, including the high salinity zones of the bays and estuaries. **Larvae:** Pelagic habitats in the Gulf of Maine, on Georges Bank, and in southern New England, including the high salinity zones of the bays and estuaries.	Sub-tidal benthic habitats in the Gulf of Maine and the western portion of Georges Bank, between 40 and 180 m, as well as mixed and high salinity zones in the coastal bays and estuaries. EFH for juvenile American plaice consists of soft bottom substrates (mud and sand), but they are also found on gravel and sandy substrates bordering bedrock.	Sub-tidal benthic habitats in the Gulf of Maine and the western portion of Georges Bank, between depths of 40 and 300 m, including high salinity zones in the coastal bays and estuaries. EFH for adult American plaice consists of soft bottom substrates (mud and sand), but they are also found on gravel and sandy substrates bordering bedrock.
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, and in the high salinity zones of bays and estuaries	Intertidal and sub-tidal benthic habitats in the Gulf of Maine, southern New England, and on Georges Bank, to a maximum depth of 120 m, including high salinity zones in bays and estuaries. Structurally complex habitats, including eelgrass, mixed sand and gravel, and rocky habitats (gravel pavements, cobble, and boulder) with and without attached macroalgae and emergent epifauna, are essential habitats for juvenile cod. In inshore waters, YOY juveniles prefer gravel and cobble habitats and eelgrass beds after settlement. Older juveniles move into deeper water and are associated with gravel, cobble, and boulder habitats, particularly those with attached organisms. Gravel is a preferred substrate for YOY juveniles on Georges Bank and they have also been observed along the small boulders and cobble margins of rocky reefs in the Gulf of Maine.	Sub-tidal benthic habitats in the Gulf of Maine, south of Cape Cod, and on Georges Bank, between 30 and 160 m, including high salinity zones in bays and estuaries. Structurally complex hardbottom habitats composed of gravel, cobble, and boulder substrates with and without emergent epifauna and macroalgae are essential habitat for adult cod. Adult cod are also found on sandy substrates and frequent deeper slopes of ledges along shore. South of Cape Cod, spawning occurs in nearshore areas and on the continental shelf, usually in depths less than 70 m.

Table F-7. (Continued)

Species	Eggs and Larvae	Juveniles/Subadults	Adults
Haddock (*Melanogrammus aeglefinus*)	**Eggs**: Pelagic habitats in coastal and offshore waters in the Gulf of Maine, southern New England, and on Georges Bank. **Larvae**: Pelagic habitats in coastal and offshore waters in the Gulf of Maine, the Mid-Atlantic, and on Georges Bank.	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.	Sub-tidal benthic habitats at depths between 50 and 160 m in the Gulf of Maine, on Georges Bank, and in southern New England. EFH for adult haddock occurs on hard sand (particularly smooth patches between rocks), mixed sand and shell, gravelly sand, and gravel substrates. They also are found adjacent to boulders and cobbles along the margins of rocky reefs in the Gulf of Maine.
Ocean pout (*Macrozoarces americanus*)	**Eggs**: Hardbottom habitats on Georges Bank, in the Gulf of Maine, and in the Mid-Atlantic Bight, as well as the high salinity zones of bays and estuaries. Eggs are laid in gelatinous masses, generally in sheltered nests, holes, or rocky crevices. EFH for ocean pout eggs occurs in depths less than 100 m on rocky bottom habitats. **Larvae**: species does not have a true larval stage.	Intertidal and sub-tidal benthic habitats in the Gulf of Maine and on the continental shelf north of Cape May, NJ; on the southern portion of Georges Bank; and in the high salinity zones of a number of bays and estuaries north of Cape Cod, extending to a maximum depth of 120 m. EFH for juvenile ocean pout occurs on a wide variety of substrates, including shells, rocks, algae, soft sediments, sand, and gravel.	Sub-tidal benthic habitats between 20 and 140 m in the Gulf of Maine; on Georges Bank; in coastal and continental shelf waters north of Cape May, NJ; and in the high salinity zones of a number of bays and estuaries north of Cape Cod. EFH for adult ocean pout includes mud and sand, particularly in association with structure-forming habitat types (i.e., shells, gravel, or boulders). In softer sediments, they burrow tail first and leave a depression on the sediment surface. Ocean pout congregate in rocky areas prior to spawning and frequently occupy nesting holes under rocks or in crevices in depths less than 100 m.

Table F-7. (Continued)

Species	Eggs and Larvae	Juveniles/Subadults	Adults
Pollack (*Pollachius virens*)	**Eggs**: Pelagic inshore and offshore habitats in the Gulf of Maine, on Georges Bank, and in southern New England, including bays and estuaries. **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.	Inshore and offshore pelagic and benthic habitats from the intertidal zone to 180 m in the Gulf of Maine, Long Island Sound, and Narragansett Bay; between 40 and 180 m on western Georges Bank and the Great South Channel; and in mixed and full salinity waters in a number of bays and estuaries north of Cape Cod. EFH for juvenile pollock consists of rocky bottom habitats with attached macroalgae (rockweed and kelp), which provide refuge from predators. Shallow water eelgrass beds are also essential habitats for YOY pollock in the Gulf of Maine. Older juveniles move into deeper water into habitats also occupied by adults.	Offshore pelagic and benthic habitats in the Gulf of Maine and, to a lesser extent, on the southern portion of Georges Bank at depths between 80 and 300 m, and in shallower sub-tidal habitats in Long Island Sound, Massachusetts Bay, and Cape Cod Bay. Essential habitats for adult pollock are the tops and edges of offshore banks and shoals (e.g., Cashes Ledge) with mixed rocky substrates, often with attached macro algae.
Silver hake (*Merluccius bilinearis*)	**Eggs and Larvae:** Pelagic habitats from the Gulf of Maine to Cape May, NJ, 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, NJ; 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 muddy sand substrates and find refuge in amphipod tube mats.	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 makes greater use of the water column (for feeding, at night) than red or white hake.

Table F-7. (Continued)

Species	Eggs and Larvae	Juveniles/Subadults	Adults
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.
White hake (*Urophycis tenuis*)	**Eggs**: Pelagic habitats in the Gulf of Maine, including Massachusetts and Cape Cod bays, and the OCS and slope. **Larvae**: Pelagic habitats in the Gulf of Maine, in southern New England, and on Georges Bank. Early-stage white hake larvae have been collected on the continental slope but cross the shelf-slope front and use nearshore habitats for juvenile nurseries. Larger larvae and pelagic juveniles have been found only on the continental shelf.	Intertidal and sub-tidal estuarine and marine habitats in the Gulf of Maine, on Georges Bank, and in southern New England, including mixed and high salinity zones in a number of bays and estuaries north of Cape Cod, to a maximum depth of 300 m. Pelagic phase juveniles remain in the water column for about two months. In nearshore waters, EFH for benthic phase juveniles occurs on fine-grained, sandy substrates in eelgrass, macroalgae, and unvegetated habitats. In the Mid-Atlantic, most juveniles settle to the bottom on the continental shelf, but some enter estuaries, especially those in southern New England. Older YOY juveniles occupy the same habitat types as the recently settled juveniles but move into deeper water (> 50 m).	Sub-tidal benthic habitats in the Gulf of Maine, including depths greater than 25 m in certain mixed and high salinity zones portions of a number of bays and estuaries, between 100 and 400 m in the outer gulf, and between 400 and 900 m on the OCS and slope. EFH for adult white hake occurs on fine-grained, muddy substrates and in mixed soft and rocky habitats. Spawning takes place in deep water on the continental slope and in Canadian waters.

Table F-7. (Continued)

Species	Eggs and Larvae	Juveniles/Subadults	Adults
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, NC. 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 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, NC, in nearshore waters (out to 80 km from shore). Inshore, EFH is the "mixing" (0.5–25.0 ppt) and "seawater" (> 25 ppt) salinity zones of estuaries. In general, summer flounder larvae are most abundant nearshore (20–80 km from shore) at depths between 10–80 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.	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, NC. 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.

Table F-7. (Continued)

Species	Eggs and Larvae	Juveniles/Subadults	Adults
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.
Winter flounder (*Pseudopleuronectes americanus*)	**Eggs**: Sub-tidal estuarine and coastal benthic habitats from mean low water to 5-m water depths from Cape Cod to Absecon Inlet (39° 22' N), and as deep as 70 m on Georges Bank and in the Gulf of Maine, including mixed and high salinity zones in bays and estuaries. The eggs are adhesive and deposited in clusters on the bottom. Essential habitat for winter flounder eggs include mud, muddy sand, sand, gravel, macroalgae, and SAV. Bottom habitats are unsuitable if exposed to excessive sedimentation, which can reduce hatching success. Larvae hatch in nearshore waters and estuaries or are transported shoreward from offshore spawning sites where they metamorphose and settle to the bottom as juveniles. They are initially planktonic but become increasingly less buoyant and occupy the lower water column as they get older.	Estuarine, coastal, and continental shelf benthic habitats from the Gulf of Maine to Absecon Inlet (39° 22' N), including Georges Bank; and in mixed and high salinity zones in bays and estuaries. EFH for juvenile winter flounder extends from the intertidal zone (mean high water) to a maximum depth of 60 m and occurs on a variety of bottom types, such as mud, sand, rocky substrates with attached macroalgae, tidal wetlands, and eelgrass. YOY juveniles are found inshore on muddy and sandy sediments in and adjacent to eelgrass and macroalgae, in bottom debris, and in marsh creeks. They tend to settle to the bottom in soft-sediment depositional areas, where currents concentrate late-stage larvae and disperse into coarser-grained substrates as they get older.	Estuarine, coastal, and continental shelf benthic habitats extending from the intertidal zone (mean high water) to a maximum depth of 70 m from the Gulf of Maine to Absecon Inlet (39° 22' N), including Georges Bank; and in mixed and high salinity zones in bays and estuaries. EFH for adult winter flounder occurs on muddy and sandy substrates, and on hardbottom on offshore banks. In inshore spawning areas, EFH includes a variety of substrates where eggs are deposited on the bottom (see eggs).
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.

Table F-7. (Continued)

Species	Eggs and Larvae	Juveniles/Subadults	Adults
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, NH, to the south shore of Long Island, NY, inshore and offshore waters of the Gulf of Maine, and on the continental shelf from Georges Bank to Cape Hatteras, NC (mostly north of 38°N).	EFH is pelagic habitats in inshore estuaries and embayments from Great Bay, NH, to the south shore of Long Island, NY, inshore and offshore waters of the Gulf of Maine, and on the continental shelf from Georges Bank to Cape Hatteras, NC (mostly north of 38°N).	EFH is pelagic habitats in inshore estuaries and embayments from Passamaquoddy Bay, ME, to the Hudson River, and on the continental shelf from Georges Bank to Cape Hatteras, NC. EFH for adult Atlantic mackerel is generally found over 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, NY, in Chesapeake Bay, and on the continental shelf and slope, primarily from Georges Bank to Cape Hatteras, NC.	EFH is pelagic habitats in inshore estuaries and embayments from Massachusetts Bay to Pamlico Sound, NC; 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

Table F-7. (Continued)

Species	Eggs and Larvae	Juveniles/Subadults	Adults
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, NY, 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 between 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, MA, south to Cape Hatteras, NC. 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, MA, south to Cape Hatteras.
Albacore tuna (*Thunnus alalunga*)	Not present in project area	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, NC.	See juveniles

Table F-7. (Continued)

Species	Eggs and Larvae	Juveniles/Subadults	Adults
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 NC/VA 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, NC.
Yellowfin tuna (*Thunnus albacares*)	Not present in project area	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, MA. Offshore and coastal habitats from Cape Cod to the mid-east coast of Florida and the Blake Plateau.	See juveniles
Skipjack tuna (*Katsuwonus pelamis*)	Not present in project area	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, NC, and localized areas in the Atlantic off South Carolina and Georgia, as well as the northern east coast of Florida.
Swordfish (*Xiphias gladius*)	Not present in project area	Offshore pelagic habitats, seaward of the continental shelf break, between Georges Bank and the Florida Keys; EFH is in depths greater than 200 m in all areas.	Offshore pelagic habitats, seaward of the continental shelf break, between Georges Bank and the Florida Keys. EFH extends from the continental shelf to the U.S. EEZ boundary off Massachusetts, Virginia, and from South Carolina through the Florida Keys.

EEZ = Exclusive Economic Zone; MAFMC = Mid-Atlantic Fishery Management Council; N/A = not applicable; NEFMC = New England Fishery Management Council; NMFS = National Marine Fisheries Service; 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. 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, hard bottom 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 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, but no adverse effects on soft bottom benthic habitats are expected due to the small spatial footprint of these activities. Hard bottom habitats would be avoided through the site selection and mapping process, and no adverse effects to 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 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 cod (**Figure E-2**).

Biological surveys, primarily fishery surveys, would likely result in some direct mortality to finfish and invertebrates, including some federally managed species or their prey. 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 ESA species. This mortality is anticipated to be undetectable within the overall fishery management regime described in **Section 4.2.3**, and lasting adverse impacts to 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 mm). Some discrete patches with different sedimentary compositions exist within the region. Most notably 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. Waves (ripples) may be 1 to 2 m high, separated by about 5 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 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). At large scales (i.e., on the order of km), ridges and swales provide relief and habitat complexity, but, for juvenile fishes, structure at smaller scales (i.e., m to cm) is more important (Diaz et al. 2003). Small scale structure 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). Soft 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; Raposa and Schwartz 2009). For example, the summer flounder juvenile HAPC mentioned above 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 waters 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, winter flounder (*Pseudopleuronectes americanus*), 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.

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 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, such as those deposited by winter flounder, 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.

Bottom trawling, especially repeated trawling over fishing grounds, is well known to damage demersal environments (Collie et al. 1997; Mazor et al. 2021). Chains and heavy doors used by bottom trawls dig into the seafloor. Bottom trawl sampling expected for the proposed NY Bight WEA leasing is expected to follow the guidelines described by BOEM (2019b). For each of the 10 proposed leases areas, 20 project area and 10 control area otter trawl tows would be collected quarterly over a 2-year period, for a total of 8 surveys. The expected total would therefore be 240 otter trawl samples per lease (30 trawls × 8 surveys). Similarly, beam trawl surveys would occur quarterly over a 2-year period, for a total of 8 surveys. Each survey would collect 6 trawls, for a total of 48 beam trawl samples per lease. These individual tows would be short duration (< 30 min), cover small areas of seafloor (< 7,000 m^2), and be spread widely over the shelf (or inshore waters). Soft bottom assemblages disturbed by trawl sample would be expected to recover in short time frames (~100 days) (Collie et al. 2000).

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 juvenile stages. Potentially vulnerable HAPCs (**Figure E-2**) are also present in inshore are waters. These include summer flounder SAV (all areas); sand tiger shark (Delaware Bay) and sandbar shark (Delaware Bay and Great Bay) nursery areas; and juvenile cod habitat (coastal Rhode Island and Narragansett Bay).

HRG Surveys

HRG surveys acquire geophysical shallow hazards information. This information is used to determine whether shallow hazards will impact seabed support of the turbines, identify the presence or absence of archaeological resources, and conduct bathymetric charting. Side-scan sonars, sub-bottom profilers, magnetometers, and multibeam echosounders may be used during HRG surveys and could add noise to the underwater environment (**Table E-2**). These surveys may affect sand tiger, sandbar shark, and juvenile cod 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 below under Pelagic Habitat (**Section E.4.3**).

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. A maximum of 2,548 samples may be collected for a total area of 2,548 m^2. Cone penetrometer and sediment profile imaging affect about 4 m^2 of seafloor for each sample for a combined total of 20,384 m^2. These sampling methods would generate noise up to 150 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 (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). 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. The maximum number of buoys expected for the project is 20, resulting in a potential impact to soft bottom habitat from anchors of 10 m^2; impacts from anchor chain sweep would be 170 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 about 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 juvenile cod 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 (kms) 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 Hard Bottom 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 hard bottom habitats. The juvenile cod HAPC consists of gravel pavement and rocky outcrops in nearshore water of Rhode Island (NEFMC 2017). Hard bottom habitats (e.g., rocky reef communities) may exist in small, isolated patches, and data collected during initial remote geophysical surveys would identify possible locations for these 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 hard bottom habitats. An example of hard bottom exclusion is the Cholera Bank in the Fairways South WEA (Guida et al. 2017).

Artificial reefs are man-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; however, the 2017 survey identified two shipwrecks in the region, but their exact locations were not reported due to archaeological site sensitivity.

Natural and artificial hard bottom habitats occur in inshore waters of the region and include rocky outcrops, oyster reefs, and blue mussel beds. Artificial hard bottom consists of construction-derived structures (breakwaters, pilings, piers, riprap shorelines, etc.) as well as planned artificial reefs (Steimle and Zeitlin 2000).

Effects on Managed and Associated Species

Managed species such as black seabass with affinities for structured habitats may be attracted to moored buoys and their anchors (Fabrizio et al. 2013). Although pelagic species, squids attach egg clusters to hard substrata ranging from clam shells to exposed rock (Jacobson 2005). With a maximum of 20 met buoys expected for the entire project, such an artificial reef effect is expected to be negligible.

Effects on Hard Bottom Habitat

No significant effects on benthic hard bottom habitats are expected due to the relatively low occurrence of these habitats in each WEA. Therefore, no impacts on hard bottom habitat or on managed or associated EFH species is expected.

Summary

Due to the scarcity of hard bottom habitat in the WEAs and surrounding area, and the avoidance measures that would be implemented, hard bottom habitats are unlikely to be affected by activities conducted 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 hard bottom 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 NY Bight (and the Middle Atlantic 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, bigeye tuna, 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 NY Lease EA (BOEM 2016) and the G&G Final PEIS (BOEM 2014) and are 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, 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.

A boomer sub-bottom profiler is the only HRG 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. Sound exposure levels are expected to be below the hearing damage thresholds for fishes and invertebrates (Popper et al. 2014). 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 population 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 NY 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.

Biological sampling may include gillnets for assessment of water column nekton. According to BOEM survey guidelines (BOEM 2019b), gillnet samples would be taken over 4 days for 12 surveys in each of the 20 locations. Although mesh-size, total length and depth of the net, and the soak time for each set may vary among projects, the sets would be relatively sparse over space and time. As a consequence, the populations of federally managed species are not expected to be adversely affected. Increased turbidity within inshore waters may affect HAPCs identified for summer flounder (SAV habitat), sand tiger shark, sandbar shark, and juvenile cod (**Figure E-2**). Elevated turbidity may affect the light penetration and growth of SAV in shallow waters. Although the potential for suspended sediment can be higher in inshore waters with high proportions of fines, widely spaced activity expected during site assessment and characterization should not generate enough suspended sediment to affect growth of SAV in the study area.

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 juvenile cod (**Figure E-2**). None of these factors are expected to adversely affect managed species, EFH, or HAPCs as they would be short duration (weeks) and conducted from moving vessels.

Impacts from acoustic sound sources from HRG survey methods such as side-scan sonar, multibeam sonar, and sub-bottom profilers are not expected. A boomer sub-bottom profiler is 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). 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 Middle Atlantic Bight) are expected. The hydrodynamic environment of the project area likely would not be adversely affected by placement of 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 short time (hours to days). Suspended sediments would dissipate within hours of being resuspended. Much of the sediment in offshore areas is sandy and expected to settle out rapidly. Fishes and squids can actively avoid clouds 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 of 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 to 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.

With respect to impacts on HAPCs, sand tiger and sandbar sharks respond to low frequency noise well below the thresholds expected for planned HRG surveys. Juvenile cod hear in a higher frequency range than sharks but would still be below the thresholds in Popper et al (2014).

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 6** of the Draft Environmental Assessment. 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 to biologically sensitive habitats, if present. Overall impacts to 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 noticeable 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 (weeks to months). Hard bottom habitats would be avoided during met buoy placement; thus, no adverse effects are anticipated.

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Appendix F: Literature Cited

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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.