Sunrise Wind - Appendix E: Planned Activities Scenario

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1.1 Planned Activities Scenario

This appendix describes the other ongoing or planned activities that could occur within the geographic analysis area for each resource and contribute to baseline conditions and trends for resources considered in this EIS. The "Project" here is the construction, operations and maintenance (O&M), and decommissioning of the Sunrise Wind Farm offshore energy project located within the Bureau of Ocean Energy Management's (BOEM's) Renewable Energy Lease Area OCS-A 0487, approximately 18.9 statute miles (mi) (16.4 nautical miles [nm], 30.4 kilometers [km]) south of Martha's Vineyard, Massachusetts, approximately 30.5 mi (26.5 nm, 48.1 km) east of Montauk, New York, and 16.7 mi (14.5 nm, 26.8 km) from Block Island, Rhode Island.

The geographic analysis area varies for each resource as described in the individual resource sections of Chapter 3. BOEM anticipates that impacts could occur between the start of Project construction in 2023 and the completion of Project decommissioning which would occur within two years of the end of the lease (up to 35 years post-construction). The geographic analysis area is defined by the anticipated geographic extent of impacts for each resource. For the mobile resources—bats, birds, finfish, and invertebrates; marine mammals; and sea turtles—the species potentially affected are those that occur within the area of impact of the Proposed Action. The geographic analysis area for these mobile resources is the general range of the species. The purpose is to capture the cumulative impacts on each of those resources that would be affected by the Proposed Action as well as the impacts that would still occur under the No Action Alternative.

In this appendix, distances in miles are in statute miles (miles used in the traditional sense) or nautical miles (miles used specifically for marine navigation). This appendix uses statute miles more commonly and refers to them simply as miles, whereas nautical miles are referred to by name or abbreviation nm.

1.2 Ongoing and Planned Activities

This section includes a list and description of ongoing and planned activities that could contribute to baseline conditions and trends within the defined geographic analysis area for each resource category analyzed in this EIS. Projects or actions that are considered speculative per the definition provided in 43 CFR 46.30[1] are noted in subsequent tables but excluded from the cumulative impact analysis in Chapter 3.

Ongoing and planned activities described in this section consist of 10 types of actions: 1) other offshore wind energy development activities; 2) undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); 3) tidal energy projects; 4) marine minerals use and ocean-dredged

[1] 43 CFR 46.30 – Reasonably foreseeable future actions include those federal and non-federal activities not yet undertaken, but sufficiently likely to occur, that a responsible official of ordinary prudence would take such activities into account in reaching a decision. The federal and non-federal activities that BOEM must take into account in the analysis of cumulative impacts include, but are not limited to, activities for which there are existing decisions, funding, or proposals identified by BOEM. Reasonably foreseeable future actions do not include those actions that are highly speculative or indefinite.

material disposal; 5) military use; 6) marine transportation; 7) fisheries use and management; 8) global climate change; 9) oil and gas activities; and 10) onshore development activities.

BOEM analyzed the possible extent of future other offshore wind energy development activities on the Atlantic Outer Continental Shelf (OCS) to determine reasonably foreseeable cumulative effects measured by installed power capacity. Table E2-1 in Attachment E2 presents the current status of projects. The methodology for developing the scenario is largely the same as for the Vineyard Wind 1 project and details of the scenario development are described in the Vineyard Wind 1 Final EIS (BOEM 2021a).

1.3 Offshore Wind Energy Development Activities

1.3.1 Site Characterization Studies

A lessee is required to provide the results of site characterization activities with its site assessment plan (SAP) or COP. For the purposes of the cumulative impact analysis, BOEM makes the following assumptions for survey and sampling activities to characterize the maximum case-scenario:

- Site characterization would occur on all existing leases and potential export cable routes.
- Site characterization would likely take place in the first 3 years following execution of a lease, based on the fact that a lessee would likely want to generate data for its COP at the earliest possible opportunity.
- Lessees would likely survey most or all of the proposed lease area during the 5-year site assessment termto collect required geophysical information for siting of a meteorological tower and/or two buoys and commercial facilities (wind turbines). The surveys may be completed in phases, with the meteorological tower and/or buoy areas likely to be surveyed first.
- Lessee would not use air guns, which are typically used for deep-penetration two-dimensional or three-dimensional exploratory seismic surveys to determine the location, extent, and properties of oil and gas resources (BOEM 2016).

Table E-1 describes the typical site characterization surveys, the types of equipment and/or method used, and which resources the survey information would inform.

Table E-1 Site Characterization Survey Assumptions

Survey Type	Survey Equipment and/or Method	Resource Surveyed or Information Used to Inform
High-resolution geophysical surveys	Side-scan sonar, sub-bottom profiler, magnetometer, multi-beam echosounder, ultra- short baseline equipment	Shallow hazards, archaeological, bathymetric charting, benthic habitat
Geotechnical/ sub-bottom sampling	Vibracores, deep borings, cone penetration tests	Geological, marine archaeology
Biological	Grab sampling, benthic sled, underwater imagery/ sediment profile imaging	Benthic habitat
	Aerial digital imaging; visual observation from boat or airplane	Birds, marine mammals, sea turtles
	Ultrasonic detectors installed on survey vessels used for other surveys	Bat
	Visual observation from boat or airplane	Marine fauna (marine mammals and sea turtles)
	Direct sampling of fish and invertebrates	Fish and invertebrates

Source: BOEM (2016).

1.3.2 Site Assessment Activities

After SAP approval, a lessee can evaluate the meteorological conditions, such as wind resources, with the approved installation of meteorological towers and/or buoys. Meteorological buoys have become the preferred meteorological and oceanographic (metocean) data collection platform for developers, and BOEM expects that most future site assessments would use buoys instead of towers (BOEM 2021d). The installation and operation of meteorological buoys involves substantially less activity and a much smaller footprint than the construction and operation of a meteorological tower. Site assessment activities have been approved or are in the process of being approved for multiple lease areas consisting of one to three meteorological buoys per SAP (see Table E2-1 in Attachment E2). Site assessment would likely take place starting within 1 to 2 years of lease execution, because preparation of the SAP (and subsequent BOEM review) takes time. This cumulative analysis considers these site assessment activities.

1.3.3 Construction and Operation of Offshore Wind Facilities

Table E2-1 in Attachment E2 lists all offshore wind leasing activities that BOEM considers reasonably foreseeable by lease areas and projects.

1.4 Commercial Fisheries Cumulative Fishery Effects Analysis

Table E-2 depicts future construction of offshore wind projects from Maine to North Carolina that are currently in various stages of planning with BOEM's offshore leases. Projected construction dates for each offshore wind project are listed in Table E2-1 in Attachment E2, and each project would require a NEPA process with an EIS or environmental assessment prior to approval.

Table E-2 summarizes (1) the incremental number of construction locations that are projected to be active in each region during each year between 2021 and 2030; (2) the number of operational turbines in each region at the beginning of each year between 2021 and 2030; and (3) the total number of active construction locations and operational turbines across the Atlantic OCS by year.

The following assumptions have been made with respect to lease areas and portions of lease areas that are included in the assessment, noting that unless noted in the bulleted list below, the entire lease area for a project is included in the quantitative analysis of commercial fishing revenues at risk:

- Vineyard Wind 1 occupies only the northwestern portion of OCS-A 0501 and could affect 51% of the commercial fishing revenue generated in the lease area (NMFS 2021).
- Sunrise Wind would be built in most of the lease area with the exception of the southeastern portion of the lease area and is assumed by the analysts that it could affect 55% of the commercial fishing revenue generated in OCS-A 0487.
- Bay State Wind would occupy the northeastern portion of OCS-A 0500 only and could affect 41% of the commercial fishing revenue generated in the lease area (NMFS 2021).
- Park City Wind would be built in two phases: Phase 1 could affect 65% of the revenues generated in the southwestern portion of OCS-A 0501 that was not used by Vineyard Wind 1; Phase 2 is assumed to comprise the remaining 35%. The southwestern portion of OCS-A 0501 comprises 49% of the commercial fisheries revenue generated in the entire lease area (NMFS 2021).
- Beacon Wind would be built in the northeastern portion of OCS-A 0520 and is assumed by analysts to potentially affect 55% of the commercial fishing revenue generated from the entire lease area.
- Mayflower Wind would comprise only the northwestern portion of OCS-A 0521 and could affect 56% of the commercial fishing revenue generated in the lease area (NMFS 2021).
- Liberty Wind 1 would occupy the northeastern portion of OCS-A 0522 and could affect 41% of the commercial fishing revenue generated in the lease area (NMFS 2021).
- Ocean Wind would occupy the eastern portion of OCS-A 0498. This area could affect 45% of the commercial fishing revenue in the lease area (NMFS 2021).
- Empire Wind Phase 1 would be constructed in the northwestern portion of OCS-A 0512. This area could affect 26% of the commercial fishing revenue in the lease area (NMFS 2021).
- Empire Wind Phase 2 would occupy the southeastern portion of OCS-A 0512. This area could affect 75% of the commercial fishing revenue in the lease area (NMFS 2021).

- Atlantic Shores Wind Farm in the first year of offshore construction is assumed to potentially affect 5% of the commercial fishing revenue of OCS-A 0499. In the second year of offshore construction, the project could affect the full extent of the lease area.
- US Wind would be built in the southeastern portion of OCS-A 0490. This area could affect 54% of the commercial fishing revenue in the lease area (NMFS 2021).
- Skipjack is assumed to be built in the southern portion of OCS-A 0519. This area could affect 26% of the commercial fishing revenue in the lease area (NMFS 2021).
- Dominion CVOW Commercial in OCS-A 0483 is assumed to develop the project in 2024 and 2025. Based on the number foundations, the analysts assume construction could affect 66% of the commercial fishing revenue in the first year, increasing in the second year to potentially affect all of the revenue in the lease area.
- Kitty Hawk in OCS-A 0508 is assumed by the analysts to potentially affect 40% of the commercial fishing revenues in the lease area.

BOEM assumes proposed offshore wind projects would include the same or similar components as the proposed Project: wind turbines, offshore and onshore cable systems, offshore substations or converter stations, onshore O&M facilities, and onshore interconnection facilities. BOEM further assumes that other potential offshore wind projects would employ the same or similar construction, O&M, and conceptual decommissioning activities as the proposed Project. However, future offshore wind projects would be subject to evolving economic, environmental, and regulatory conditions. Lease areas may be split into multiple projects, expanded, or removed, and development within a particular lease area may occur in phases over long periods of time. Research currently being conducted in combination with data gathered regarding physical, biological, socioeconomic, and cultural resources during development of initial offshore wind projects in the United States could affect the design and implementation of future projects, as could advancements in technology. For the cumulative impact analysis, the proposed projects included in Table E2-1 in Attachment E2 are analyzed in Chapter 3 of this EIS.

Table E-2 Future Offshore Wind Project Construction Schedule (dates shown as of October 24, 2022)

Region/Project*	Number of Foundations										
	Before 2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 and Beyond
Aqua ventis (state waters)	-	-	-	2	-	-	-	-	-	-	-
Total Other State Waters Projects	-	-	-	2	-	-	-	-	-	-	-
Estimated Other State Waters Construction	**-**	**-**	**-**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Estimated O&M total	**-**	**-**	**-**	**0**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Existing and Ongoing Projects											
Block Island Wind Farm (state waters)	5	-	-	-	-	-	-	-	-	-	-
Vineyard Wind 1, part of OCS-A 0501	-	-	-	63	-	-	-	-	-	-	-
South Fork, OCS-A 0517	-	-	-	13	-	-	-	-	-	-	-
Coastal Virginia Offshore Wind, OCS-A 0497	2	-	-	-	-	-	-	-	-	-	-
Estimated Existing and Ongoing Project Construction	**7**	**0**	**0**	**78**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Estimated O&M Total	**0**	**7**	**7**	**7**	**85**	**85**	**85**	**85**	**85**	**85**	**85**
Planned Projects											
Massachusetts/Rhode Island Region											
Revolution, part of OCS-A 0486	-	-	-	102		-	-	-	-	-	-
Sunrise, OCS-A 0487	-	-	-	-	95	-	-	-	-	-	-
Mayflower, OCS-A 0521	-	-	-	-	-	149	-	-	-	-	-
New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	-	-	-	-	64			-	-	-	-
New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	-	-	-	-	82			-	-	-	-
Beacon Wind 1, part of OCS-A 0520	-	-	-	-	79	-	-	-	-	-	-
Beacon Wind 2, part of OCS-A 0520	-	-	-	-	-	78	-	-	-	-	-
Bay State Wind, part of OCS-A 0500	-	-	-	-	-	112					
OCS-A 0500 remainder	-	-	-	-	-						
OCS-A 0487 remainder	-	-	-	-	-	232					
Liberty Wind, part of OCS-A 0522	-	-	-	-	-						

Region/Project*	Number of Foundations										
	Before 2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 and Beyond
Estimated annual MA/RI Construction	**0**	**0**	**0**	**102**	**320**	**571**	**0**	**0**	**0**	**0**	**0**
Estimated O&M Total	**0**	**0**	**0**	**0**	**102**	**320**	**891**	**891**	**891**	**891**	**891**
New York/New Jersey Region											
Ocean Wind 1, OCS-A 0498	-	-	-	-	101	-	-	-	-	-	-
Atlantic Shores South, OCS-A 0499	-	-	-	-	-	11	200		-	-	-
Ocean Wind 2, part of OCS-A 0532	-	-	-	-	-	-	113				
Empire Wind 1, part of OCS-A 0512	-	-	-	58				-	-	-	-
Empire Wind 2, part of OCS-A 0512	-	-	-	91					-	-	-
Atlantic Shores North, OCS-A 0549	-	-	-	-	-	-	160				
Ow Ocean Winds East LLC, OCS-A 0537	-	-	-	-	-	-	102				
Attentive Energy LLC, OCS-A 0538	-	-	-	-	-	-	104				
Bight Wind Holdings, LLC, OCS-A 0539	-	-	-	-	-	-	148				
Atlantic Shores Offshore Wind Bight LLC, OCS-A 0541	-	-	-	-	-	-	95				
Invenergy Wind Offshore LLC, OCS-A 0542	-	-	-	-	-	-	99				
Vineyard Mid-Atlantic LLC, OCS-A 0544	-	-	-	-	-	-	104				
Estimated annual NY/NJ Construction	**0**	**0**	**0**	**149**	**101**	**11**	**1,125**	**0**	**0**	**0**	**0**
Estimated O&M Total	**0**	**0**	**0**	**0**	**149**	**250**	**261**	**1,386**	**1,386**	**1,386**	**1,386**
Delaware/Maryland Region											
Skipjack, OCS-A 0519	-	-	-	-	17	-	-	-	-	-	-
US Wind, OCS-A 0490	-	-	-	-	126	-	-	-	-	-	-
Garden State Offshore Energy I LLC, OCS-A 0482	-	-	-	93							
OCS-A 0519 remainder	-	-	-								
Estimated annual DE/MD Construction	**0**	**0**	**0**	**93**	**143**	**0**	**0**	**0**	**0**	**0**	**0**
Estimated O&M Total:	**0**	**0**	**0**	**0**	**93**	**236**	**236**	**236**	**236**	**236**	**236**
Virginia/North Carolina Region											
CVOW-C, OCS-A 0483	-	-	-	208					-	-	-

Region/Project*	Number of Foundations										
	Before 2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 and Beyond
Kitty Hawk North, OCS-A 0508	-	-	-	-	70						
Kitty Hawk South, OCS-A 0508	-	-	-	-	-	-	-	123			
Estimated annual VA/NC Construction	**0**	**0**	**0**	**208**	**701**	**0**	**0**	**123**	**0**	**0**	**0**
Estimated O&M Total	**0**	**0**	**0**	**0**	**208**	**278**	**278**	**278**	**401**	**401**	**401**
Total											
Estimated Annual Total Construction	**7**	**0**	**0**	**630**	**634**	**582**	**1,125**	**123**	**0**	**0**	**0**
Estimated O&M Total	**7**	**7**	**7**	**7**	**637**	**1,271**	**1,853**	**2,978**	**3,101**	**3,101**	**3,101**

*Projects in italics have already been constructed or are ongoing. Completed and ongoing projects are not included in project totals.

1.5 Incorporation by Reference of Cumulative Impacts Study

BOEM has completed a study of IPFs on the North Atlantic OCS to consider in an offshore wind development cumulative impacts scenario (BOEM 2019), which is incorporated by reference. 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 cumulative impact 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.

The BOEM (2019) study identifies the relationships between IPFs associated with specific ongoing and planned activities in the North Atlantic OCS to consider in a NEPA cumulative impacts scenario. These IPFs and their relationships were utilized in the EIS analysis of cumulative impacts, and the application of which IPF applied to which resource was decided by BOEM.

As discussed in the BOEM (2019) study, reasonably foreseeable activities other than offshore wind projects may also affect the same resources as the proposed Project or other offshore wind projects, possibly via the same IPFs or via IPFs through which offshore wind projects do not contribute. This appendix lists reasonably foreseeable non-offshore wind activities that may contribute to the cumulative impacts of the proposed Project.

1.6 Undersea Transmission Lines, Gas Pipelines, and Other Submarine Cables

The following existing undersea transmission lines, gas pipelines, and other submarine cables are located near the Project:

- New Shoreham (Block Island), Rhode Island, is served by a submarine power cable from the Block Island Wind Farm to New Shoreham (Block Island).
- A submarine power cable connects Block Island to the mainland electrical grid at Narragansett, Rhode Island.
- Service to Martha’s Vineyard is provided by four electric cables from Falmouth, located in three corridors through Vineyard Sound. Two cables are located in the same corridor between Elm Road in Falmouth and West Chop; one is located between Shore Street in Falmouth and Eastville (East Chop), and one connects between Mill Road in Falmouth and West Chop.
- Two cables service Nantucket through Nantucket Sound, from Dennis Port and Hyannis Port to landfall at Jetties Beach.
- Additional submarine cables, including fiber-optic cables and trans-Atlantic cables that originate near Charlestown, Rhode Island; New York City; Long Island, near Trenton, New Jersey; and

Wall, New Jersey, are located offshore New England and mid-Atlantic states, but outside the proposed Lease Area.

- Two natural gas pipelines are located offshore Boston, Massachusetts, in Massachusetts Bay and lead to liquified natural gas (LNG) export facilities: the Neptune pipeline and the Northeast Gateway LNG pipeline.

The offshore wind projects listed in Table E2-1 in Attachment E2 that have a COP under review are presumed to include at least one identified cable route.

1.7 Tidal Energy Projects

The following tidal energy projects have been proposed or studied on the U.S. East Coast and are in operation or considered reasonably foreseeable:

- The Bourne Tidal Test Site, located in the Cape Cod Canal near Bourne, Massachusetts, is a testing platform for tidal turbines that was installed in late 2017 by the Marine Renewable Energy Collaborative. The Bourne Tidal Test Site offers a test platform for tidal turbines (MRECo 2017, 2018).
- Cobscook Bay Tidal Project, located in Maine, is a Federal Energy Regulatory Commission- (FERC) licensed tidal project that began operations in 2012. The project owner, Ocean Power Energy Company, has informed FERC that it would not apply for relicensing, and removal and site restoration activities are anticipated to be conducted prior to its current license expiration date in January 2022 (FERC 2012a).
- Western Passage Tidal Energy Project, a proposed tidal energy site in the Western Passage, received a preliminary permit from FERC in 2016. The preliminary permit allows developers to study a project but does not authorize construction.
- 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 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 (FERC 2012b; Verdant Power 2018).

1.8 Dredging and Port Improvement Projects

The following dredging projects have been proposed or studied between New York, New York, and Boston, Massachusetts, and are either in operation or are considered reasonably foreseeable:

- The U.S. Army Corps of Engineers (USACE) New England District partnership with Rhode Island Coastal Resources Management Council (RI CRMC) proposes a project that would dredge approximately 23,700 cubic yards of sandy material from the Point Judith Harbor Federal Navigation Project to widen the existing 15-foot-deep mean lower low water (MLLW) West Bulkhead channel by 50 feet and extend the same channel approximately 1,200 feet into the North Basin area (USACE 2018a).
- The Plymouth Harbor Federal Navigation Project in Plymouth, Massachusetts, includes maintenance dredging of approximately 385,000 cubic yards of sand and silt from approximately

75 acres of the authorized project area in order to restore the project to authorized and maintained dimensions (USACE 2018b).

- The Port of New Bedford was awarded a $15.4 million U.S. Department of Transportation Better Utilizing Investments to Leverage Development grant to improve the port's infrastructure and to help with the removal of contaminated materials. The funding would be used to extend the port's bulkhead, creating room for 60 additional commercial vessels, and additional sites for offshore wind staging (Phillips 2018).
- Proposed New Haven Harbor Improvements would include deepening the main ship channel, maneuvering area, and turning basin to -40 feet MLLW and widening the main channel and turning basin to allow larger vessels to efficiently access the Port of New Haven's terminals. The proposed improvements would remove approximately 4.28 million cubic yards of predominately glacially deposited silts from the federal channel (USACE 2018c).
- The Nature Conservancy seeks a permit to place an artificial reef array in Narraganset Bay at 130 Shore Road in Narragansett Bay in East Providence, Rhode Island. The proposed work involves the construction of a 0.14-acre artificial reef using 91 pre-fabricated reef modules. The artificial reef array would consist of 58 Pallet Balls (4.0 × 2.9 feet) and 33 Bay Balls (3 × 2 feet). The reef modules would be transported to the project site by barge and lowered to the seafloor by crane (USACE 2019).
- The RICRMC has awarded funding for nine habitat restoration projects comprising four salt marsh restoration and enhancement projects, two projects involving restoration of fish passage, one coastal buffer project, and two projects for technical and support services related to habitat restoration (RI CRMC 2018a).
- The Town of Dennis seeks a permit for the selective dredging of multiple navigation and mooring basins within multiple waterways in the towns of Dennis and Yarmouth. Suitable dredged material would be used as nourishment on multiple town-owned beaches in Dennis whereas material that is not deemed suitable for beach nourishment would be disposed of at the Cape Cod Bay Disposal Site and at the South Dennis Landfill. The town is requesting to dredge approximately 434,310 cubic yards from portions of these waterways over 10 years encompassing an area of approximately 96.03 acres (USACE 2018d).

The following port improvement projects have been proposed in Connecticut, Rhode Island, Massachusetts, and/or New Jersey, and are either in operation or are considered reasonably foreseeable:

- The Connecticut Port Authority (CPA) announced a $93 million public-private partnership to upgrade the Connecticut State Pier in New London to support the offshore wind industry (Sheridan 2019). According to the Connecticut Maritime Strategy 2018 (CPA 2018a), New London is the only major port between New York and Maine that does not have vertical obstruction and offshore barriers, two factors that are critical for offshore wind turbine assembly. The document includes strategic objectives to manage and redevelop the Connecticut State Pier partially to support the offshore wind industry, which could create a dramatic increase in demand for the Connecticut State Pier and regional job growth. The development partnership, announced in May 2019, includes a 3-year plan to upgrade infrastructure to meet heavy-lift requirements of Orsted and Eversource offshore wind components (Cooper 2019). Redevelopment of the Connecticut State Pier is considered a reasonably foreseeable activity.

- In Rhode Island, Revolution Wind, LLC has committed to investing approximately $40 million in improvements at the Port of Providence, the Port of Davisville at Quonset Point, and possibly other Rhode Island ports for the Revolution Wind Project (Kuffner 2018). This investment would position Rhode Island ports to participate in construction and operation of future offshore wind projects in the region (Rhode Island Governor's Office 2018). The Port of Davisville has added a 150-megaton mobile harbor crane, which would enable the port to handle wind turbines and heavy equipment and enables the Port of Davisville to participate in regional offshore wind projects (Port of Davisville 2017). Further improvements at Rhode Island ports to support the offshore wind industry are considered reasonably foreseeable.
- The Massachusetts Clean Energy Center (MassCEC) has identified 18 waterfront sites in Massachusetts that may be available and suitable for use by the offshore wind industry. Potential activities at these sites include manufacturing of offshore wind transmission cables, manufacture and assembly of turbine components, substation manufacturing and assembly, O&M bases, and storage of turbine components (MassCEC 2017a, MassCEC 2017b, MassCEC 2017c).
- The MassCEC manages the New Bedford Marine Commerce Terminal in New Bedford, Massachusetts. The 29-acre facility was completed in 2015 and is the first in North America designed specifically to support the construction, assembly, and deployment of offshore wind projects (MassCEC 2018). The New Bedford Port Authority Strategic Plan 2018–2023 contains goals related to expanding the New Bedford Marine Commerce Terminal to improve and expand services to the offshore wind industry, including development of North Terminal with the capacity to handle two separate offshore wind installation projects in the future (Port of New Bedford 2018). Vineyard Wind signed an 18-month lease with the Marine Commerce Terminal in October 2018 (Port of New Bedford 2020) and has supported the New Bedford Port Authority with grants to develop publicly owned facilities to support shore-based operations for offshore wind facilities (Vineyard Wind 2019).

1.9 Marine Minerals Use and Ocean Dredged Material Disposal

The closest active lease in BOEM's Marine Minerals Program for sand borrow areas for beach replenishment is located offshore New Jersey near Harvey Cedars, Surf City, Long Beach Township, Ship Bottom, and Beach Haven (Lease Number OCS-A-0505) (BOEM 2018).

In addition, reconnaissance and/or design-level OCS studies along the East Coast from Rhode Island to Florida have identified potential future sand resources. Sand resources identified nearest the Project include locations offshore Rhode Island (between Block Island and Charlestown), Long Island (Rockaway Beach, Long Beach, and Fire Island, New York), and Sandy Hook, New Jersey.

The EPA Region 1 is responsible for designating and managing ocean disposal sites for materials offshore in the region of the Project. The USACE issues permits for ocean disposal sites; all ocean sites are for the disposal of dredged material permitted or authorized under the Marine Protection, Research, and Sanctuaries Act (16 USC 1431 et seq. and 33 USC 1401 et seq.). There are nine active projects along the Massachusetts, Rhode Island, Connecticut, and New York coasts, with the closest dredge disposal project, the Rhode Island Sound Disposal Site (RISDS) located northeast of Block Island (USACE 2018e).

1.10 Military Use

Military activities can include various vessel training exercises, submarine and antisubmarine training, and U.S. Air Force exercises. The U.S. Navy, the U.S. Coast Guard (USCG), and other military entities have numerous facilities in the region. Major onshore regional facilities include Joint Base Cape Cod, Naval Station Newport, Newport Naval Undersea Warfare Center, Naval Submarine Base New London, and USCG Academy (BOEM 2013; Epsilon Associates, Inc 2018; RI CRMC 2010). The U.S. Atlantic Fleet also conducts training and testing exercises in the Narraganset Bay Operating Area, and the Newport Naval Undersea Warfare Center routinely performs testing in the area (BOEM 2013).

1.11 Marine Transportation

Marine transportation in the region is diverse and sourced from many ports and private harbors from New York to Massachusetts. Commercial vessel traffic in the region includes research, tug/barge, liquid tankers (such as those used for liquid petroleum), cargo, military, search-and-rescue vessels, and commercial fishing vessels. Recreational vessel traffic includes cruise ships, sailboats, and charter boats. A number of federal agencies, state agencies, educational institutions, and environmental non-governmental organizations participate in ongoing research offshore including oceanographic, biological, geophysical, and archaeological surveys. The Northeast Regional Planning Body (NRPB) anticipates that major vessel traffic routes would be relatively stable in the region for the foreseeable future, but that coastal developments and market demands that are unknown at this time could affect them (NRPB 2016). One new regional maritime highway project received funding from the Maritime Administration. A new barge service (Davisville/Brooklyn/Newark Container-on-Barge Service) is proposed to run twice each week in state waters between Newark, New Jersey; Brooklyn, New York; and the Port of Davisville in Rhode Island (USDOT Maritime Administration 2021), which is located on Quonset Point, one of the potential construction and O&M locations.

1.12 National Marine Fisheries Service Activities

Research and enhancement permits may be issued for marine mammals protected by the Marine Mammal Protection Act (MMPA) and for threatened and endangered species under the ESA. The National Marine Fisheries Service (NMFS) is anticipated to continue issuing research permits under section 10(a)(1)(A) of the ESA to allow take of certain ESA-listed species for scientific research. Scientific research permits issued by NMFS currently authorize studies on ESA-listed species in the Atlantic Ocean, some of which occur in portions of the Lease Area. Current fisheries management and ecosystem monitoring surveys conducted by or in coordination with the Northeast Fisheries Science Center (NEFSC) could overlap with offshore wind lease areas in the New England region and south into the Mid-Atlantic region. Surveys include 1) the NEFSC Bottom Trawl Survey, a more than 50-year multispecies stock assessment tool using a bottom trawl; 2) the NEFSC Sea Scallop/Integrated Habitat Survey, a sea scallop stock assessment and habitat characterization tool, using a bottom dredge and camera tow; 3) the NEFSC Surfclam/Ocean Quahog Survey, a stock assessment tool for both species using a bottom dredge; and 4) the NEFSC Ecosystem Monitoring Program, a more than 40-year shelf ecosystem monitoring program using plankton tows and conductivity, temperature, and depth units. These surveys are anticipated to continue within the region, regardless of offshore wind development.

The regulatory process administered by NMFS, which includes stock assessments for all marine mammals and 5-year reviews for all ESA-listed species, assists in informing decisions on take authorizations and the assessment of project-specific and cumulative impacts that consider past, present, and reasonably foreseeable future actions in biological opinions. Stock assessments completed regularly under MMPA include estimates of potential biological removal that stocks of marine mammals can sustainably absorb. MMPA take authorizations require that a proposed action have no more than a negligible impact on species or stocks, and that a proposed action impose the least practicable adverse impact on the species. MMPA authorizations are reinforced by monitoring and reporting requirements so that NMFS is kept informed of deviations from what has been approved. Biological opinions for federal and non-federal actions are similarly grounded in status reviews and conditioned to avoid jeopardy and to allow continued progress toward recovery. These processes help to ensure that, through compliance with these regulatory requirements, a proposed action would not have a measurable impact on the conservation, recovery, and management of the resource.

1.12.1 Directed Take Permits for Scientific Research and Enhancement

NMFS issues permits for research on protected species for scientific purposes. These scientific research permits include the authorization of directed take for activities such as capturing animals and taking measurements and biological samples to study their health, tagging animals to study their distribution and migration, photographing and counting animals to get population estimates, taking animals in poor health to an animal hospital, and filming animals. NMFS also issues permits for enhancement purposes; these permits are issued to enhance the survival or recovery of a species or stock in the wild by taking actions that increase an individual's or population's ability to recover in the wild. In waters near the Lease Area, scientific research and enhancement permits have been issued previously for satellite, acoustic, and multi-sensor tagging studies on large and small cetaceans, research on reproduction, mortality, health, and conservation issues for North Atlantic Right Whales, and research on population dynamics of harbor and gray seals. Reasonably foreseeable future impacts from scientific research and enhancement permits include physical and behavioral stressors (e.g., restraint and capture, marking, implantable and suction tagging, biological sampling).

1.12.2 Fisheries Use and Management

NMFS implements regulations to manage commercial and recreational fisheries in federal waters, including those within which the Project would be located; the State of New York, state of Rhode Island, and Commonwealth of Massachusetts regulate commercial fisheries in state waters (within 3 nautical miles of the coastline).

The Project overlaps two of NMFS' eight regional councils to manage federal fisheries: Mid-Atlantic Fishery Management Council (MAFMC) which includes New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina; and New England Fishery Management Council (NEFMC), which includes Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut (NEFMC 2016). The councils manage species with many fisheries management plans that are frequently updated, revised, and amended and coordinate with each other to jointly manage species across jurisdictional boundaries (MAFMC 2019). 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 lobster and Jonah crab fisheries are cooperatively managed by the states and NMFS under the framework of the ASMFC (2019).

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, 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 (HMS), such as tuna and sharks, that can travel long distances and cross domestic boundaries.

1.13 Global Climate Change

Section 7.6.1.4 of the *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf* (Minerals Management Service [MMS] 2007) describes global climate change with respect to assessing renewable energy development. Climate change is predicted to affect Northeast fishery species differently (Hare et al. 2016), and the NMFS biological opinion discusses in detail the potential impacts of global climate change on protected species that occur within the proposed action area (NMFS 2013).

The Intergovernmental Panel on Climate Change (IPCC) released a special report in October 2018 that compared risks associated with an increase of global warming of 1.5 degrees Celsius (°C) and 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 2018).

Table E-3 summarizes regional plans and policies that are in place to address climate change, and Table E-4 summarizes resiliency plans.

Table E-3 Climate Change Plans and Policies

Plans and Policies	Summary/Goal
New York	
Reforming the Energy Vision (New York State 2014)	State’s energy policy to build integrated energy network; Clean energy goal to reduce greenhouse gases (GHGs) 40% by 2030 and 80% by 2050.
Order Adopting a Clean Energy Standard (State of New York Public Service Commission 2016)	Requirement that 50% of New York’s electricity come from renewable energy sources by 2030.
New York State Energy Plan 2015; 2017 Biennial Report to 2015 Plan (New York State Energy Research Development Authority [NYSERDA] 2015, 2017a)	Requires 40% reduction in GHGs from 1990 levels; 50% electricity would come from renewable energy resources; and 600 trillion British thermal units (Btu) increase in statewide energy efficiency.
Governor Cuomo State of State Address 2017, 2018, 2021	2017: Set offshore wind energy development goal of 2,400 MW by 2030 (Governor’s Office 2017a). 2018: Procurement of at least 800 MW of offshore wind power between two solicitations in 2018 and 2019; new energy efficiency target for investor-owned utilities to more than double utility energy efficiency progress by 2025; energy storage initiative to achieve 1,500 MW of storage by 2025 and up to 3,000 MW by 2030 (Governor Office 2018b, 2018c). 2021: The governor's 2021 agenda—Reimagine | Rebuild | Renew—establishes a goal of building out its renewable energy program. The agenda notes the development of two new offshore wind farms more than 20 miles off the shore of Long Island, the creation of dedicated offshore port facilities, and additional transmission capacity development.
Governor Hochul State of the State Address (2022)	2022: Announced NYSERDA’s third offshore wind procurement to be initiated in 2022; the procurement is expected to result in at least 2 GW of new offshore wind projects. 2022: Announced a $500 million infrastructure investment to develop offshore wind manufacturing and supply chain infrastructure. 2022: Announced a legislative proposal to ensure all new building construction reaches zero emissions by 2027, and to develop 2 million electrified or electrification-ready homes by 2030.
New York State Offshore Wind Master Plan (2017) (NYSERDA 2017b)	Grants NYSERDA ability to award 25-year long-term contracts for projects ranging from approximately 200 MW to approximately 800 MW, with an ability to award larger quantities if sufficiently attractive proposals are received. Each proposer is also required to submit at least one proposal of approximately 400 MW.
2020 Offshore Wind Solicitation	As noted above, NYSERDA has provisionally awarded two offshore wind projects, totaling 2,490 MW. Empire Wind 2 (1,260 MW) and Beacon Wind (1,230 MW) of Equinor Wind US LLC would generate enough clean energy to power 1.3 million homes and would be major economic drivers, supporting the following: • More than 5,200 direct jobs • Combined economic activity of $8.9 billion in labor, supplies, development, and manufacturing statewide • $47 million in workforce development and just access funding

Plans and Policies	Summary/Goal
The Climate Leadership and Community Protection Act (CLCPA), enacted on July 18, 2019, signed into law in July 2019 and effective January 1, 2020	CLCPA establishes economy-wide targets to reduce GHG emissions by 40% of 1990 levels by 2030 and 85% of 1990 levels by 2050.
Massachusetts	
Global Warming Solutions Act (GWSA) of 2008	Framework to reduce GHG emissions by requiring 25% reduction in emissions from all sectors below 1990 baseline emission level in 2020, at least 80% reduction in 2050. Full implementation of these policies is projected to result in total net reduction of 25.0 million metric tons of carbon dioxide equivalent, or 26.4% below 1990 baseline level (Commonwealth of Massachusetts 2018a).
Massachusetts Clean Energy and Climate Plan (CECP) for 2020; 2015 CECP Update	Policies that aim to reduce GHG emissions in the commonwealth across all sectors; full implementation of policies would result in reducing emissions by at least 25% below 1900 level in 2020 (Commonwealth of Massachusetts 2015).
Executive Order 569, Establishing an Integrated Climate Strategy for the Commonwealth and “Act to Promote Energy Diversity” (2016)	Calls for large procurements of offshore wind and hydroelectric resources (Commonwealth of Massachusetts 2016).
Environmental Bond Bill and An Act to Advance Clean Energy (2018)	Sets new targets for offshore wind, solar, and storage technologies; expands Renewable Portfolio Standard requirements for 2020–2029; establishes a Clean Peak Standard; and permits fuel switching in energy efficiency programs (Commonwealth of Massachusetts 2018a).
Massachusetts State Hazard Mitigation and Climate Adaption Plan 2018	Updated 2013 plan to comprehensively integrate climate change impacts and adaptation strategies with hazard mitigation planning while complying with federal requirements for state hazard mitigation plans and maintaining eligibility for federal disaster recovery and hazard mitigation funding under the Stafford Act. The plan would next be submitted to the Federal Emergency Management Agency (FEMA) for approval. In 2020, a new 2030 emissions limit and CECP for 2030 would be published (Commonwealth of Massachusetts 2018a, 2018b).
Massachusetts 2050 Decarbonization Roadmap	A planning process by the Massachusetts Executive Office of Energy and Environmental Affairs to identify cost-effective and equitable strategies to ensure Massachusetts reduces GHG emissions by at least 85% by 2050 and achieves net-zero emissions (Commonwealth of Massachusetts 2020a)
Massachusetts Clean Energy and Climate Plan (CECP) for 2030	The Clean Energy and Climate Plan for 2030 (2030 CECP) provides details on the actions the Commonwealth would undertake through the next decade to ensure the 2030 emissions limit is met. The 2030 CECP is prepared in coordination with the development of the 2050 Decarbonization Roadmap such that the strategies, policies, and actions outlined in the 2030 CECP can help the Commonwealth achieve net zero GHG emissions by 2050. The Interim 2030 CECP was built upon the 2020 CECP and the 2015 CECP Update (Commonwealth of Massachusetts 2020b).
2030 GHG Emissions Limit	The 2030 emissions limit of 45% below the 1990 GHG emissions level was set on December 30, 2020, in accordance with Executive Order 569 to help the Commonwealth meet the 2050 emissions limit (Commonwealth of Massachusetts 2020c)
Net Zero by 2050 Emissions Limit	A 2050 statewide emissions limit of net zero GHG emissions was established by the Commonwealth. This is defined as a level of statewide

Plans and Policies	Summary/Goal
	GHG emissions that is equal in quantity to the amount of carbon dioxide or its equivalent that is removed from the atmosphere and stored annually by, or attributable to, the Commonwealth; provided, however, that in no event shall the level of emissions be greater than a level that is 85 percent below the 1990 level (Commonwealth of Massachusetts 2020d).
Rhode Island	
Governor's Climate Priorities (2018) Executive Order 15-17, 17-06	Increasing in-state renewable energy tenfold by 2020 (to 1,000 MWs) through new development and regional procurement (State of Rhode Island 2015a, 2017, 2018a).
Resilient Rhode Island Act (2014)	Established the Executive Climate Change Coordinating Council (EC4) and set specific GHG reduction targets; incorporates consideration of climate change impacts into the powers and duties of all state agencies (State of Rhode Island 2014).
Rhode Island Greenhouse Gas Emissions Reductions Plan (2016)	Targets for GHG reductions: 10% below 1990 levels by 2020; 45% below 1990 levels by 2035; 80% below 1990 levels by 2040 (State of Rhode Island 2016).
Energy 2035 Rhode Island State Energy Plan (2015)	Long-term comprehensive strategy for energy services across all sectors using a secure, cost-effective, and sustainable energy system; plan to increase sector fuel diversity, produce net economic benefits, and reduce GHG emissions by 45% by the year 2035 (State of Rhode Island 2015b).
Resilient Rhody (2018)	Planning document outlining climate resiliency actions; focuses on leveraging emissions reduction targets and adaptation (State of Rhode Island 2018b).
Executive Order 20-01, Advancing a 100% Renewable Energy Future for Rhode Island by 2030	Calls the Rhode Island Office of Energy Resources (OER) to conduct economic and energy market analyses to develop an actionable plan to reach 100% renewable electricity by 2030. The OER must provide this specific and implementable action plan by December 31, 2020 (State of Rhode Island 2020a).
The Road to 100% Renewable Electricity by 2030 in Rhode Island	Provides economic analysis of the key factors that would guide Rhode Island in the coming years as the state accelerates its adoption of carbon-free renewable resources. The OER developed specific policy, programmatic, planning, and equity-based actions that would support achieving the 100% renewable electricity goal (Rhode Island OER 2020).
2021 Act on Climate	This legislation updates Rhode Island's climate-emission reduction goals laid out in the 2014 Resilient RI Act and address areas such as environmental injustices, public health inequities, and a fair employment transition as fossil-fuel jobs are replaced by green energy jobs. The state would develop a plan to incrementally reduce climate emissions to net-zero by 2050 and is to be updated every 5 years (State of Rhode Island 2020b).
Connecticut	
2008 Global Warming Solutions Act	Sets forth statutory requirements to reduce GHG emissions 10% below 1990 levels by 2020 and 80% below 2001 levels by 2050 (State of Connecticut 2008).
Building A Low Carbon Future for Connecticut: Achieving a 45% GHG reduction by 2030 (2018)	Proposed set of strategies to achieve 45% GHG reduction below 2001 levels target by 2030. These strategies ensure Connecticut is on a downward trajectory to the 80% reduction target by 2050 required by the Global Warming Solutions Act (State of Connecticut 2018a).
2018 Act Concerning Climate Change Planning and Resiliency (Public Act 18-82)	Act passed by the Connecticut General Assembly that adopted GC3's recommendation of 45% GHG mid-term reduction target below 2001 levels by 2030 and integrates GHG reduction more explicitly into the DEEP

Plans and Policies	Summary/Goal
	Comprehensive Energy Strategy (CES) and Integrated Resource Plan (IRP) (State of Connecticut 2018b).
Comprehensive Energy Strategy (CES) (2018)	Connecticut Department of Energy and Environmental Protection (DEEP) update to Connecticut's CES to advance the State's goal of creating a cheaper, cleaner, more reliable energy future for Connecticut's residents and businesses. The CES analyzes energy use and key trends of the region (State of Connecticut 2018c)
Executive Order No. 3, (2019)	Re-establishes and expands the membership and responsibilities of the Governor's Council on Climate change (GC3), originally established in 2015. Orders GC3 to report to the Governor regarding the state's progress on the implementation of the strategies identified in *Building a Low Carbon Future for Connecticut: Achieving a 45% GHG reduction by 2030* (State of Connecticut 2019)
Integrated Resources Plan (2020)	DEEP is required to prepare an Integrated Resource Plan (IRP) every 2 years, which is comprised of an assessment of the future electric needs and a plan to meet those future needs. Executive Order 3 directed DEEP to analyze pathways and recommend strategies to achieve a 100 percent zero carbon electric supply by 2040 in this IRP (State of Connecticut 2020).
Taking Action on Climate Change and Building a More Resilient Connecticut for All (2021)	Phase 1 report in response to Executive Order 3's request for progress on mitigation strategies and preparation of an Adaptation and Resilience Plan. Provides information on GC3 members and Working Group members, GC3 background and process, the Equity and Environmental Justice Working Group, the impacts of climate change in Connecticut, and recommendations for near-term action (State of Connecticut 2021)

Table E-4 Resiliency Plans and Policies in the Lease Area

Plans and Policies	Summary
New York	
Part 490 of Community Risk and Resiliency Act (CRRA) of 2014	Establishes statewide science-based sea-level rise projections for coastal regions of the state. As of 2019, DEC is in the process of developing a State Flood Risk Management Guidance document for state agencies (New York State Department of Environmental Conservation [NYSDEC] n.d.).
NY Rising Community Reconstruction (NYRCR) (2018)	$20.4 million in projects on Long Island to help flood-prone communities plan and prepare for extreme weather events as they continue projects to recover from Superstorm Sandy, Hurricane Irene, and Tropical Storm Lee. Three projects were announced for Suffolk County and five for Nassau County (Governor's Office 2018c).
Water Infrastructure Improvement Act (WIIA), Water Quality Improvement Project (WQIP) Program, and Intermunicipal Grant (IMG)	$600 million available to communities statewide for programs to fund projects to upgrade infrastructure and make communities more resilient to flooding and other impacts of climate-driven severe storms and weather events (Governor's Office 2021).
Massachusetts	
Municipal Vulnerability Preparedness grant program (MVP) (2017)	Provides support for cities and towns to plan for resiliency and implement key climate change adaptation actions for resiliency. The City of New Bedford has received MVP designation as of November 1, 2018 (Commonwealth of Massachusetts 2019a).
Coastal Grant and Resilience Program	Provides financial and technical support for local efforts to increase awareness and understanding of climate impacts, identify and map

Plans and Policies	Summary
	vulnerabilities, conduct adaptation planning, redesign vulnerable public facilities and infrastructure, and implement non-structural approaches that enhance natural resources and provide storm damage protection (Commonwealth of Massachusetts 2019b).
General Appropriations Bill, FY2022 (Section 2000-0101)	Designation of funds for the Executive Office of Energy and Environmental Affairs to coordinate and implement strategies for climate change adaptation and preparedness, including, but not limited to, resiliency plans for the commonwealth in a report to be delivered by February 3, 2022 (Commonwealth of Massachusetts Legislature 2021).
Rhode Island	
Nantucket's Coastal Resilience Plan	The plan is currently under development, and while no actions have been identified to date, potential shoreline management activities could include sediment management, construction of seawalls and similar structures, and other activities (Town and County of Nantucket 2018a, 2018b).
Shoreline Change Special Area Management Plan (Beach SAMP)	RI CRMC is developing the Shoreline Change Special Area Management Plan (Beach SAMP) to improve the state's resilience and manage the shoreline (Town and County of Nantucket 2018b) (RI CRMC 2018b).
Connecticut	
Act Authorizing Municipal Climate Change and Coastal Resiliency Reserve Funds (CCCRRF) (Public Act 19-77)	Act approved July 1, 2019. Upon the recommendation of the chief elected official and budget-making authority, and approval of the legislative body of a municipality, the reserve fund may be used and appropriated to pay for municipal property losses, capital projects and studies related to mitigating hazards and vulnerabilities of climate change including, but not limited to, land acquisition (Connecticut General Assembly 2019).
Resilient Connecticut	Connecticut Institute for Resilience & Climate Adaptation (CIRCA) was awarded an $8 million from the National Disaster Relief Competition (NDRC) to develop the *Resilient Connecticut* project. Coordination of CIRCA, state agencies, and regional councils of governments and municipalities initiated the development of a Planning Framework to establish resilient communities through smart planning that incorporates economic development framed around transit-oriented development, conservation strategies, and critical infrastructure improvements (Resilient Connecticut (CIRCA 2021).
An Act Concerning Climate Change Adaptation (Public Act 21-115)	Act approved July 6, 2021. This proposal addresses the rising seas, frequent flooding, heat waves, and drought expected between now and 2050. It prioritizes the protection of frontline vulnerable communities and provides Connecticut's communities more options to move from adaptation and resilience planning to implementing their project pipeline, including the use of nature-based and green infrastructure solutions (Connecticut General Assembly 2021).

1.14 Oil and Gas Activities

The proposed Lease Area is located in the North Atlantic Planning Area of the OCS Oil and Gas Leasing Program (National OCS Program). On September 8, 2020, the White House issued a presidential memorandum for the Secretary of the Interior on the withdrawal of certain areas of the U.S. OCS from leasing disposition for 10 years, including the areas currently designated by BOEM as the South Atlantic and Straits of Florida Planning Areas (The White House 2020a). The South Atlantic Planning Area includes the OCS off South Carolina, Georgia, and northern Florida. On September 25, 2020, the White

House issued a similar memorandum for the Mid-Atlantic Planning Area that lies south of the northern administrative boundary of North Carolina (The White House 2020b). This withdrawal prevents consideration of these areas for any leasing for purposes of exploration, development, or production during the 10-year period beginning July 1, 2022 and ending June 30, 2032. However, at this time, there has been no decision by the Secretary of the Interior regarding future oil and gas leasing in the North Atlantic or remainder of the Mid-Atlantic Planning Areas. Existing leases in the withdrawn areas are not affected.

BOEM issues geological and geophysical (G&G) permits to obtain data for hydrocarbon exploration and production; locate and monitor marine mineral resources; aid in locating sites for alternative energy structures and pipelines; identify possible human-made, seafloor, or geological hazards; and locate potential archeological and benthic resources. G&G surveys are typically classified into categories by equipment type and survey technique. There are currently no such permits under review for areas offshore of the northeast Atlantic states; however, areas under consideration for G&G surveys are located in federal waters offshore from Delaware to Florida (BOEM 2021b).

Eight LNG ports are located on the East Coast of the United States. Table E-5 lists existing, approved, and proposed LNG ports on the East Coast of the United States that provide (or may in the future provide) services such as natural gas export, natural gas supply to the interstate pipeline system or local distribution companies, or storage of LNG for periods of peak demand, or production of LNG for fuel and industrial use (FERC 2021).

Table E-5 Liquid Natural Gas Terminals Located in the Northeastern United States

Terminal Name	Type	Company	Jurisdiction	Distance from Project (approximate)	Status
Everett, MA	Import terminal	GDF SUEZ—DOMAC	FERC	90 miles north	Existing
Offshore Boston, MA	Import terminal	GDF SUEZ – Neptune LNG	U.S. Department of Transportation Maritime Administration (MARAD)/USCG	100 miles north	Existing
Offshore Boston, MA	Import terminal, authorized to re-export delivered LNG	Excelerate Energy—Northeast Gateway	MARAD/USCG	95 miles north	Existing
Cove Point, MD (Chesapeake Bay)	Import terminal	Dominion—Cove Point LNG	FERC	340 miles southwest	Existing
Elba Island, GA (Savannah River)	Import terminal	El Paso—Southern LNG	FERC	835 miles southwest	Existing
Elba Island, GA (Savannah River)	Export terminal	Southern LNG Company	FERC	835 miles southwest	Existing
Jacksonville, FL	Export terminal	Eagle LNG Partners	FERC	960 miles southwest	Approved

Source: FERC (2021).

1.15 Onshore Development Activities

Onshore development activities that may contribute to impacts from planned activities include visible infrastructure such as onshore wind turbines and cell towers, port development, and other energy projects such as transmission and pipeline projects. Coastal development projects permitted through regional planning commissions and towns may also contribute to impacts from planned activities. These may include residential, commercial, and industrial developments spurred by population growth in the region (Table E-6).

Table E-6 Existing, Approved, and Proposed Onshore Development Activities

Type	Description
Local planning documents	• Suffolk County Master Plan (Suffolk County 2015) • A City Master Plan: New Bedford 2020 (City of New Bedford 2010) • Town of North Kingstown Comprehensive Plan Update 2008 (Town of North Kingstown 2008) • Washington County Transfer of Development Rights (TDR) Study (Washington County Regional Planning Council 2012) • North Kingstown Comprehensive Plan Re-Write 2019 (Interface Studio 2019)
Onshore wind projects	According to the U.S. Geological Survey (USGS), there are nine onshore wind projects located within the 41-mile viewshed of the project (USGS 2018).
Communications towers	• There are numerous communications towers located in Suffolk County, on offshore islands, and within the viewshed of the proposed Project components. Within the recreation/tourism geographic analysis area, there are 864 communications towers, 10 of which exceed the Federal Aviation Administration (FAA) height limit for marking/lighting requirements (FAA 2016). • The East Hampton Town Board is replacing its aging 800-megahertz frequency emergency communication system tower to a 700-megahertz system with updated equipment. This would require the replacement of a 150-foot communication tower with a 300-foot lattice tower and the raising of a 55-foot monopole to 85 feet. This upgrade also requires replacing antennas at towers near the East Hampton Airport in Wainscott, at the Amagansett firehouse, and at the East Hampton Town Hall complex (Chinese 2018).
Development projects	• As a part of New York State's $100 billion infrastructure project, $5.6 billion would go to transform the Long Island Railroad (LIRR) to improve system connectivity. Within Suffolk County, the following stations would receive funds for upgrades: Brentwood, Deer Park, East Hampton, Northport, Ronkonkoma, Stony Brook, Port Jefferson, and Wyandanch. The East Hampton historic LIRR station would undergo upgrades and modernizations (Metropolitan Transit Authority 2017; Governor's Office 2017b). Additional plans for transit-oriented design (TOD) and highway improvements are planned in Suffolk County in state and county planning documents. • The Division of Statewide Planning, Rhode Island Department of Transportation, and Rhode Island Public Transit Authority prepared the Rhode Island State Transportation Improvement Program (STIP) for the Federal Fiscal Year (FFY) 2022-2023 for the adoption by the State Planning Council (State of Rhode Island 2021). • Fire Island Inlet to Montauk Point (FIMP) Project is a $1.2 billion project by the USACE, NYDEC, and Long Island, NY, municipalities to engage in inlet management; beach, dune

Type	Description
	and berm construction; breach response plans; raising and retrofitting 4,400 homes; road-raising; groin modifications; and coastal process features. Within Suffolk County, portions of the Towns of Babylon, Islip, Brookhaven, Southampton, and East Hampton; 12 incorporated villages along Long Island's south shore (mainland); Fire Island National Seashore; and the Poospatuck and Shinnecock Indian Reservations would be involved in this project (USACE 2018f). • The USACE is working to remediate and cleanup a former defense site (former NIKE Battery PR-58 and Disaster Village Training Area) at Quonset Development Corporation in North Kingstown, RI. A feasibility study was performed from 2014 to 2016, and the final remedial investigation/feasibility study was published in 2016. Pre-design investigations, followed by remedial designs and engineering plans, and remedial action is proposed for 2021 (USACE 2018g). • The Massachusetts Department of Environmental Protection (MassDEP) Bureau of Air and Waste approved National Grid's application for the construction and operation of a diesel generator and a battery electric storage system at an existing electric generating facility located at 32 Bunker Road in Nantucket, approximately 1 mile north of the coastline. The facilities are anticipated to be operational in 2019 (MassDEP 2017; Utility Dive 2018).
Port studies/ upgrades	The USACE completed the Lake Montauk Harbor Feasibility Study in 2020. The study determined that Lake Montauk Harbor has insufficient channel and depth to support commercial fishing fleet activities. The study evaluated a range of alternative navigation improvement plans; the recommended plan consisted of deepening the existing navigation channel to -17 feet MLLW depth, creating a deposition basin immediately east of the channel at a width of 100 feet, and placing dredged material on the shoreline west of the inlet for a distance of 3,000 feet and a width of approximately 44 feet. Ports in New York, Connecticut, Rhode Island, and Massachusetts may require upgrades to support the offshore wind industry developing in the northeastern United States. Upgrades may include onshore developments or underwater improvements (such as dredging). • In December 2017, NYSERDA issued an offshore wind master plan that assessed 54 distinct waterfront sites along the New York Harbor and Hudson River and 11 distinct areas with multiple small sites along the Long Island coast. Twelve waterfront areas and five distinct areas were singled out for "potential to be used or developed into facilities capable of supporting OSW projects" (Table 26; NYSERDA 2017b). Nearly all identified sites would require some level of infrastructure upgrade (from minimal to significant) depending on OSW activities intended for the site. Particular sites of interest include Red Hook-Brooklyn, South Brooklyn Marine Terminal, and the Port of Coeymans (NYSERDA 2017b). For additional information regarding specific proposed improvements to these ports, see DockNYC (2018), Capital Region Economic Development Council (2018), American Association of Port Authorities (2016), Rulison (2018), and New York City Economic Development Corporation (2018). • The CPA is currently evaluating proposals from parties to develop, finance, and manage the Connecticut State Pier in New London under a long-term operating agreement (CPA 2018b). According to the Connecticut Maritime Strategy 2018 (CPA 2018a), New London is the only major port between New York and Maine that does not have vertical obstruction and offshore barriers, two factors that are critical for offshore wind turbine assembly. The document includes strategic objectives to manage and redevelop the Connecticut State Pier partially to support the offshore wind industry, which could create a dramatic increase in demand for the Connecticut State Pier and regional job growth. Redevelopment of the State Pier is considered a reasonably foreseeable activity, though specific redevelopment plans are not yet available.

Type	Description
	• In Rhode Island, DWW has committed to investing approximately $40 million in improvements at the Port of Providence, the Port of Davisville at Quonset Point, and possibly other Rhode Island ports for the Revolution Wind Project (Kuffner 2018). The Port of Davisville has added a 150-megaton mobile harbor crane, which would enable the port to handle wind turbines and heavy equipment and enables the Port of Davisville to participate in regional offshore wind projects (Port of Davisville 2017). Further improvements at Rhode Island ports to support the offshore wind industry are considered reasonably foreseeable. • The MassCEC has identified 18 waterfront sites in Massachusetts that may be available and suitable for use by the offshore wind industry. Potential activities at these sites include manufacturing of offshore wind transmission cables, manufacture and assembly of turbine components, substation manufacturing and assembly, O&M bases, and storage of turbine components (MassCEC 2017a, 2017b, 2017c). The Draft New Bedford Port Authority Strategic Plan 2018 – 2023 contains goals related to expanding the New Bedford Marine Commerce Terminal to improve and expand services to the offshore wind industry (Port of New Bedford 2018; MassCEC 2018), but no new improvements were identified. • New York State proposed port improvements include the governor's 2021 agenda—Reimagine | Rebuild | Renew—which includes upgrades to create five dedicated port facilities for offshore wind, including the following: ○ The nation's first offshore wind tower manufacturing facility, to be built at the Port of Albany ○ An offshore wind turbine staging facility and O&M hub to be established at the South Brooklyn Marine Terminal ○ Increasing the use of the Port of Coeymans for cutting-edge turbine foundation manufacturing ○ Buttressing ongoing O&M out of Port Jefferson and Port of Montauk Harbor in Long Island

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Attachment E1: Ongoing and Future Non-Offshore Wind Activity Analysis

BOEM developed the following tables based on its 2019 study *National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf* (BOEM 2019), which evaluates potential impacts associated with ongoing and future non-offshore wind activities. The content of these tables has been vetted by cooperating agencies to the EIS and therefore has been included in whole for their use in impact and cumulative analyses, and for ease in reference by the reader.

Table E1-1 Summary of Activities and the Associated Impact-producing Factors for Air Quality

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/fluids/ hazmat	Accidental releases of air toxics or HAPs are due to potential chemical spills. Ongoing releases would occur in low frequencies. These may lead to short-term periods of toxic pollutant emissions through surface evaporation. According to the U.S. Department of Energy, 31,000 barrels of petroleum are spilled into U.S. waters from vessels and pipelines in a typical year. Approximately 40.5 million barrels of oil were lost as a result of tanker incidents from 1970 to 2009, according to International Tanker Owners Pollution Federation Limited, which collects data on oil spills from tankers and other sources. From 1990 to 1999, the average annual input to the coastal Northeast was 220,000 barrels of petroleum and offshore it was up to less than 70,000 barrels.	Accidental releases of air toxics or HAPs would be due to potential chemical spills. Gradually increasing vessel traffic over the next 34 years[2] would increase the risk of accidental releases. These may lead to short-term periods of toxic pollutant emissions through evaporation. Air quality impacts would be short term and limited to the local area at and around the accidental release location.
Air emissions: Construction and decommissioning	Air emissions originate from combustion engines and electric power generated by burning fuel. These activities are regulated under the CAA to meet set standards. Air quality has generally improved over the last 35 years; however, some areas in the Northeast have experienced a decline in air quality over the last 2 years. Some areas of the Atlantic coast remain in nonattainment for ozone, with the source of this pollution from power generation. Many of these states have made commitments toward cleaner energy goals to improve this, and offshore wind is part of these goals. Primary processes and activities that can affect the air quality impacts are expansions and modifications to existing fossil fuel power plants, onshore and	The largest air quality impacts over the next 34 years would occur during the construction phase of any one project; however, projects would be required to comply with the CAA. During the limited construction and decommissioning phases, emissions may occur that are above *de minimis* thresholds and would require offsets and mitigation. Primary emission sources would be increased commercial vehicular traffic, air traffic, public vehicular traffic, and combustion emissions from construction equipment and fugitive emissions from construction-generated dust. As projects come online, power generation emissions overall would decline, and the industry as a whole would have a net benefit on air quality.

[2] The 34-year period for the Project is based on a 4-year construction period (2024–2027) and a 30-year operating period; with decommissioning commencing in 2058.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Air emissions: O&M	offshore activities involving renewable energy facilities, and various construction activities. The construction, operation, and decommissioning of offshore wind projects would produce GHG emissions (nearly all CO_2) that can contribute to climate change; however, these contributions would be minuscule compared to aggregate global emissions. CO_2 is relatively stable in the atmosphere and generally mixed uniformly throughout the troposphere and stratosphere; therefore, the impact of GHG emissions does not depend upon the source location. Increasing energy production from offshore wind projects would likely decrease GHGs emissions by replacing energy from fossil fuels.	Activities associated with O&M of onshore wind projects would have a proportionally very small contribution to emissions compared to the construction and installation and decommissioning activities over the next 34 years. Emissions would largely be due to commercial vehicular traffic and operation of emergency diesel generators. Such activity would result in short-term, intermittent, and widely dispersed emissions and small air quality impacts.
Air emissions: Power generation emissions reductions		Many Atlantic states have committed to clean energy goals, with offshore wind being a large part of that. Other reductions include transitioning to onshore wind and solar. The No Action Alternative without implementation of other future offshore wind projects would likely result in increased air quality impacts regionally due to the need to construct and operate new energy generation facilities to meet future power demands. These facilities may consist of new natural-gas-fired power plants, coal-fired, oil-fired, or clean-coal-fired plants. These types of facilities would likely have larger and continuous emissions and result in greater regional scale impacts on air quality.
Air emissions: GHGs		Development of future onshore wind projects would produce a small overall increase in GHG emissions over the next 34 years. However, these contributions would be very small compared to the aggregate global emissions. The impact on climate change from these activities would be very small. As more projects come online, there would be some reduction in GHG emissions from modifications of existing fossil fuel facilities to reduce power generation. Overall, it is anticipated that there would be no cumulative impact on global warming as a result of onshore wind project activities.
Climate change	The construction, operation, and decommissioning of offshore wind projects would produce GHG emissions (nearly all CO2) that can contribute to climate change; however, these contributions would be minuscule compared to aggregate global emissions. CO2 is relatively stable in the atmosphere and generally mixed uniformly throughout the troposphere and stratosphere.	Development of future onshore wind projects would produce a small overall increase in GHG emissions over the next 35 years. However, these contributions would be very small compared to the aggregate global emissions. The impact on climate change from these activities would be very small. As more projects come online, some reduction in GHG emissions from

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
	Hence the impact of GHG emissions does not depend upon the source location. Increasing energy production from offshore wind projects would likely decrease GHGs emissions by replacing energy from fossil fuels.	modifications of existing fossil fuel facilities to reduce power generation. Overall, it is anticipated that there would be no cumulative impact on global warming as a result of onshore wind project activities.

HAP = hazardous air pollutant; hazmat = hazardous materials

Table E1-2 Summary of Activities and the Associated Impact-Producing Factors for Bats

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded and would result in high-intensity, low-exposure-level, long-term, but localized intermittent risk to bats in nearshore waters. Direct impacts are not expected to occur, as recent research has shown that bats may be less sensitive to TTS than other terrestrial mammals (Simmons et al. 2016). Indirect impacts (i.e., displacement from potentially suitable habitats) could occur as a result of construction activities, which could generate noise sufficient to cause avoidance behavior (Schaub et al. 2008). Construction activity would be short-term and highly localized.	Similar to under ongoing activities, noise associated with pile-driving activities would be limited to nearshore waters and these high-intensity but low-exposure risks would not be expected to result in direct impacts. Some indirect impacts (i.e., displacement from potentially suitable foraging habitats) could occur as a result of construction activities, which could generate noise sufficient to cause avoidance behavior (Schaub et al. 2008). Construction activity would be short-term and highly localized, and no population-level effects would be expected.
Noise: Construction	Onshore construction occurs regularly for generic infrastructure projects in the bats geographic analysis area. There is a potential for displacement caused by equipment if construction occurs at night (Schaub et al. 2008). Any displacement would only be short-term. No individual or population-level impacts would be expected. Some bats roosting in the vicinity of construction activities may be disturbed during construction but would be expected to move to a different roost farther from construction noise. This would not be expected to result in any impacts, as frequent roost switching is a common component of a bat's life history (Hann et al. 2017; Whitaker 1998).	Onshore construction is expected to continue at current trends. Some behavioral responses and avoidance of construction areas may occur (Schaub et al. 2008). However, no injury or mortality would be expected.
Presence of structures:	There may be a few structures scattered throughout the offshore bats geographic analysis area, such as navigation and weather	The infrequent installation of future new structures in the marine environment of the next 34 years is expected to continue. As

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Migration disturbances	buoys and light towers. Migrating bats can easily fly around or over these sparsely distributed structures, and no migration disturbance would be expected. Bat use of offshore areas is very limited and generally restricted to spring and fall migration. Very few bats would be expected to encounter structures on the OCS and no population-level effects would be expected.	described under ongoing activities, these structures would not be expected to cause disturbance to migrating tree bats in the marine environment.
Presence of structures: Turbine strikes	There may be a few structures in the offshore bats geographic analysis area, such as navigation and weather buoys, turbines, and light towers. Migrating tree bats can easily fly around or over these sparsely distributed structures, and no strikes would be expected.	The infrequent installation of future new structures in the marine environment of the next 34 years is expected to continue. As described under ongoing activities, these structures would not be expected to result in increased collision risk to migrating tree bats in the marine environment.
Land disturbance: Onshore construction	Onshore construction activities are expected to continue at current trends. Potential direct effects on individuals may occur if construction activities include tree removal when bats are potentially present. Injury or mortality may occur if trees being removed are occupied by bats at the time of removal. While there is some potential for indirect impacts associated with habitat loss, no individual or population-level effects would be expected.	Future non-offshore wind development would continue to occur at the current rate. This development has the potential to result in habitat loss and could result in injury or mortality of individuals.
Climate change: Warming and sea level rise, storm severity and frequency	Storms during breeding and roosting season can reduce productivity and increase mortality. Intensity of this impact is speculative.	No future activities were identified within the bats geographic analysis area other than ongoing activities
Climate change: Warming and sea level rise, increased disease frequency	Disease can weaken, lower reproductive output, and/or kill individuals. Some tropical diseases would move northward. Extent and intensity of this impact is highly speculative.	No future activities were identified within the bats geographic analysis area other than ongoing activities

Table E1-3 Summary of Activities and the Associated Impact-Producing Factors for Benthic Resources

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	Accidental releases of hazmat occur periodically, mostly consisting of fuels, lubricating oils, and other petroleum compounds. Because most of these materials tend to float in seawater, they rarely contact benthic resources. The chemicals with potential to sink or dissolve rapidly often dilute to non-toxic levels before they affect benthic resources. The corresponding impacts on benthic resources are rarely noticeable.	Gradually increasing vessel traffic over the next 34 years would increase the risk of accidental releases. See the previous cell and water quality for details.
Accidental releases: Invasive species	Invasive species are periodically released accidentally during ongoing activities, including the discharge of ballast water and bilge water from marine vessels. The impacts on benthic resources (e.g., competitive disadvantage, smothering) depend on many factors, but can be noticeable, widespread, and permanent.	No future activities were identified within the geographic analysis area other than ongoing activities.
Accidental releases: Trash and debris	Ongoing releases of trash and debris occur from onshore sources, fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, and lines and pipeline laying. However, there does not appear to be evidence that ongoing releases have detectable impacts on benthic resources.	No future activities were identified within the geographic analysis area other than ongoing activities.
Anchoring	Regular vessel anchoring related to ongoing military, survey, commercial, and recreational activities continue to cause short-term to permanent impacts in the immediate area where anchors and chains meet the seafloor. These impacts include increased turbidity levels and the potential for direct contact to cause injury and mortality of benthic resources, as well as physical damage to their habitats. All impacts are localized, turbidity is short-term, injury and mortality are recovered in the short term, and physical damage can be permanent if it occurs in eelgrass beds or hard bottom.	No future activities were identified within the geographic analysis area other than ongoing activities.
EMFs	EMFs continuously emanate from existing telecommunication and electrical power transmission cables. New cables generating EMFs are infrequently installed in the geographic analysis area. Some benthic	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	species can detect EMFs, although EMFs do not appear to present a barrier to movement. The extent of impacts (behavioral changes) is likely less than 50 feet (15.2 meters) from the cable and the intensity of impacts on benthic resources is likely undetectable.	
New cable emplacement/ maintenance	Cable maintenance activities infrequently disturb benthic resources and cause short-term increases in suspended sediment; these disturbances would be localized and limited to the emplacement corridor. New cables are infrequently added near shore. Cable emplacement/maintenance activities injure and kill benthic resources and result in short-term to long-term habitat alterations. The intensity of impacts depends on the time (season) and place (habitat type) where the activities occur. (See also the IPFs of seabed profile alterations and sediment deposition and burial.)	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: Onshore/ offshore construction	Detectable impacts of construction noise on benthic resources rarely, if ever, overlap from multiple sources.	Detectable impacts of construction noise on benthic resources would rarely, if ever, overlap from multiple sources.
Noise: G&G	Detectable impacts of G&G noise on benthic resources rarely, if ever, overlap from multiple sources.	Detectable impacts of G&G noise on benthic resources would rarely, if ever, overlap from multiple sources.
Noise: O&M	See finfish, invertebrates, and EFH.	See finfish, invertebrates, and EFH.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water or through the seabed can cause injury or mortality of benthic resources in a small area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: Cable laying/trenching	Infrequent trenching activities for pipeline and cable laying, as well as other cable burial methods, emit noise. These disturbances are localized and short-term, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	New or expanded submarine cables and pipelines are likely to occur in the geographic analysis area. These disturbances would be infrequent over the next 34 years and localized and short-term, and would extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	See finfish, invertebrates, and EFH.	See finfish, invertebrates, and EFH.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb, injure, or kill benthic resources, creating small, short-term, localized impacts.	Future new cables would present additional risk of gear loss, resulting in small, short-term, localized impacts (disturbance, injury).
Presence of structures: Hydrodynamic disturbance	See finfish, invertebrates, and EFH.	See finfish, invertebrates, and EFH.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables, continuously create uncommon relief in a mostly sandy seascape. Structure-oriented fishes are attracted to these locations. Increased predation upon benthic resources by structure-oriented fishes can adversely affect populations and communities of benthic resources. These impacts are localized and permanent.	New cables installed in the geographic analysis area over the next 34 years would likely require hard protection atop portions of the route (see the Cable emplacement/ maintenance row in this table). Any new towers, buoys, or piers would also create uncommon relief in a mostly flat, sandy seascape. Structure-oriented fishes could be attracted to these locations. Increased predation upon benthic resources by structure-oriented fishes could adversely affect populations and communities of benthic resources. These impacts are expected to be localized and to be permanent as long as the structures remain.
Presence of structures: Habitat conversion	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables, continuously provide uncommon hard-bottom habitat. A large portion is homogeneous sandy seascape but there is some other hard or complex habitat. Benthic species dependent on hard-bottom habitat can benefit on a constant basis, although the new habitat can also be colonized by invasive species (e.g., certain tunicate species). Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat.	See above for quantification and timing. Any new towers, buoys, piers, or cable protection structures would create uncommon relief in a mostly sandy seascape. Benthic species dependent on hard-bottom habitat could benefit, although the new habitat could also be colonized by invasive species (e.g., certain tunicate species). Soft bottom is the dominant habitat type in the region, and species that rely on this habitat would not likely experience population-level impacts (Guida et al. 2017; Greene et al. 2010).
Presence of structures: Cable infrastructure	The presence of cable infrastructure, especially hard protection atop cables, causes impacts through entanglement/gear loss/ damage, fish aggregation, and habitat conversion.	See other sub-IPFs within Presence of structures.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Discharges	The gradually increasing amount of vessel traffic is increasing the cumulative permitted discharges from vessels. Many discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated. However, there does not appear to be evidence that the volumes and extents have any impact on benthic resources.	There is the potential for new ocean dumping/dredge disposal sites in the Northeast. Impacts (disturbance, reduction in fitness) of infrequent ocean disposal on benthic resources are short term because spoils are typically recolonized naturally. In addition, USEPA has established dredge spoil criteria and it regulates the disposal permits it issues; these discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated.
Regulated fishing effort	Ongoing commercial and recreational regulations for finfish and shellfish implemented and enforced by states, towns, and/or NOAA, depending on jurisdiction, affect benthic resources by modifying the nature, distribution and intensity of fishing-related impacts, including those that disturb the seafloor (trawling, dredge fishing).	No future activities were identified within the geographic analysis area other than ongoing activities.
Seabed profile alterations	Ongoing sediment dredging for navigation purposes results in localized short-term impacts (habitat alteration, injury, and mortality) on benthic resources through this IPF. Dredging typically occurs only in sandy or silty habitats, which are abundant in the geographic analysis area and are quick to recover from disturbance. Therefore, such impacts, while locally intense, have little impact on benthic resources in the geographic analysis area.	No future activities were identified within the geographic analysis area other than ongoing activities.
Sediment deposition and burial	Ongoing sediment dredging for navigation purposes results in fine sediment deposition. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local, limited to the emplacement corridor. Sediment deposition could have adverse impacts on some benthic resources, especially eggs and larvae, including smothering and loss of fitness. Impacts may vary based on season/time of year. Where dredged materials are disposed, benthic resources are smothered. However, such areas are typically recolonized naturally in the short term. Most sediment dredging projects have time-of-year restrictions to minimize impacts on benthic resources. Most benthic resources in the geographic analysis area are adapted to the turbidity and periodic	USACE and/or private ports may undertake dredging projects periodically. Where dredged materials are disposed, benthic resources are buried. However, such areas are typically recolonized naturally in the short term. Most benthic resources in the geographic analysis area are adapted to the turbidity and periodic sediment deposition that occur naturally in the geographic analysis area.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	sediment deposition that occur naturally in the geographic analysis area.	
Climate change: Ocean acidification	Ongoing CO2 emissions causing ocean acidification may contribute to reduced growth or the decline of benthic invertebrates that have calcareous shells, as well as reefs and other habitats formed by shells.	No future activities were identified within the geographic analysis area other than ongoing activities.
Climate change: Warming and sea level rise, altered habitat, ecology, and migration patterns	Climate change, influenced in part by ongoing GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the distributions of benthic species and altering ecological relationships, likely causing permanent changes of unknown intensity gradually over the next 35 years.	No future activities were identified within the geographic analysis area other than ongoing activities.
Climate change: Warming and sea level rise, disease frequency	Climate change, influenced in part by ongoing GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the frequencies of various diseases of benthic species, and likely causing permanent changes of unknown intensity over the next 35 years.	No future activities were identified within the geographic analysis area other than ongoing activities.

hazmat = hazardous materials

Table E1-4 Summary of Activities and the Associated Impact-Producing Factors for Birds

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/ hazmat	Ongoing releases are frequent/chronic. Ingestion of hydrocarbons can lead to morbidity and mortality due to decreased hematological function, dehydration, drowning, hypothermia, starvation, and weight loss (Briggs et al. 1997; Haney et al. 2017; Paruk et al. 2016). Additionally, even small exposures that cause feather oiling can lead to sublethal effects that include changes in flight efficiencies and result in increased energy expenditure during daily and seasonal activities including chick provisioning, commuting, courtship, foraging, long-distance migration, predator evasion, and territory defense (Maggini et al. 2017). These impacts rarely result in population-level impacts.	Gradually increasing vessel traffic over the next 34 years would increase the potential risk of accidental releases and associated impacts, including mortality, decreased fitness, and health effects on individuals. Impacts are unlikely to affect populations.
Accidental releases: Trash and debris	Trash and debris are accidentally discharged through onshore sources; fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation, navigation, and traffic; survey activities; and cables, lines, and pipeline laying on an ongoing basis. In a study from 2010, students at sea collected more than 520,000 bits of plastic debris per square mile. In addition, many fragments come from consumer products blown out of landfills or tossed out as litter (Law et al. 2010). Birds may accidentally ingest trash mistaken for prey. Mortality is typically a result of blockages caused by both hard and soft plastic debris (Roman et al. 2019).	As population and vessel traffic increase gradually over the next 34 years, accidental release of trash and debris may increase. This may result in increased injury or mortality of individuals. However, there does not appear to be evidence that the volumes and extents would have any impact on bird populations.
Light: Vessels	Ocean vessels have an array of lights including navigational lights, deck lights, and interior lights. Such lights can attract some birds. The impact is localized and short-term. This attraction would not be expected to result in an increased risk of collision with vessels. Population-level impacts would not be expected.	Gradually increasing vessel traffic over the next 34 years would increase the potential for bird and vessel interactions. While birds may be attracted to vessel lights, this attraction would not be expected to result in increased risk of collision with vessels. No population-level impacts would be expected.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Light: Structures	Buoys, towers, and onshore structures with lights can attract birds. Onshore structures like houses and ports emit a great deal more light than offshore buoys and towers. This attraction has the potential to result in an increased risk of collision with lighted structures (Hüppop et al. 2006). Light from structures is widespread and permanent near the coast, but minimal offshore.	Light from onshore structures is expected to gradually increase in proportion with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
New cable emplacement/ maintenance	Cable emplacement and maintenance activities disturb bottom sediments and cause short-term increases in suspended sediment; these disturbances would be short-term and generally limited to the emplacement corridor. Infrequent cable maintenance activities disturb the seafloor and cause short-term increases in suspended sediment; these disturbances would be short-term and limited to the emplacement corridor. Suspended sediment could impair the vision of diving birds that are foraging in the water column (Cook and Burton 2010). However, given the localized nature of the potential impacts, individuals would be expected to successfully forage in nearby areas not affected by increased sedimentation and no biologically significant impacts on individuals or populations would be expected.	Future new cables, would occasionally disturb the seafloor and cause short-term increases in suspended sediment, resulting in localized, short-term impacts. Impacts would be short-term and localized, with no biologically significant impacts on individuals or populations.
Noise: Aircraft	Aircraft routinely travel in the geographic analysis area for birds. With the possible exception of rescue operations and survey aircraft, no ongoing aircraft flights would occur at altitudes that would elicit a response from birds. If flights are at a sufficiently low altitude, birds may flush, resulting in non-biologically significant increased energy expenditure. Disturbance, if any, would be localized and short-term and impacts would be expected to dissipate once the aircraft has left the area.	Aircraft noise is likely to continue to increase as commercial air traffic increases; however, very few flights would be expected to be at a sufficiently low altitude to elicit a response from birds. If flights are at a sufficiently low altitude, birds may flush, resulting in non-biologically significant increased energy expenditure. Disturbance, if any, would be localized and short-term and impacts would be expected to dissipate once the aircraft has left the area.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: G&G	Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around sites of investigation. These activities could result in diving birds leaving the local area. Non-diving birds would be unaffected. Any displacement would only be short-term during non-migratory periods, but impacts could be greater if displacement were to occur in preferred feeding areas during seasonal migration periods.	Same as ongoing activities, with the addition of possible future oil and gas surveys.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water could result in intermittent, short-term, localized impacts on diving birds due to displacement from foraging areas if birds are present in the vicinity of pile-driving activity. The extent of these impacts depends on pile size, hammer energy, and local acoustic conditions. No biologically significant impacts on individuals or populations would be expected.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Noise: Onshore construction	Onshore construction is routinely used in generic infrastructure projects. Equipment could potentially cause displacement. Any displacement would only be short-term, and no individual fitness or population-level impacts would be expected.	Onshore construction would continue at current trends. Some behavioral responses could range from escape behavior to mild annoyance, but no individual injury or mortality would be expected.
Noise: Vessels	Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Sub-surface noise from vessels could disturb diving birds foraging for prey below the surface. The consequence to birds would be similar to that of noise from G&G but likely less because noise levels are lower.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Presence of structures: Entanglement, gear loss, gear damage	Each year, 2,551 seabirds die annually from interactions with U.S. commercial fisheries on the Atlantic (Sigourney et al. 2019). Even more die due to abandoned commercial fishing gear (nets). In addition, recreational fishing gear (hooks and lines) is periodically lost on existing buoys, pilings, hard protection, and other structures and has the potential to entangle birds.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent

Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various hard protections atop cables, create uncommon relief in a mostly flat seascape. Structure-oriented fishes are attracted to these objects. These impacts are localized and can be short term to permanent. Fish aggregation can provide localized, short-term to permanent, beneficial impacts on some bird species because it could increase prey species availability.	New cables, installed incrementally in the geographic analysis area for birds over the next 20 to 34 years, would likely require hard protection atop portions of the cables (see Cable emplacement/maintenance row). Any new towers, buoys, or piers would also create uncommon relief in a mostly flat seascape. Structure-oriented fishes could be attracted to these locations. Abundance of certain fishes may increase. These impacts are expected to be localized and may be short term to permanent. These fish aggregations can provide localized, short-term to permanent beneficial impacts on some bird species due to increased prey species availability.
Presence of structures: Migration disturbances	A few structures may be scattered about the offshore geographic analysis area for birds, such as navigation and weather buoys and light towers. Migrating birds can easily fly around or over these sparsely distributed structures.	The infrequent installation of future new structures in the marine or onshore environment over the next 34 years would not be expected to result in migration disturbances.
Presence of structures: Turbine strikes, displacement, and attraction	A few structures may be in the offshore geographic analysis area for birds, such as navigation and weather buoys, turbines, and light towers. Given the limited number of structures currently in the geographic analysis area, individual- and population-level impacts due to displacement from current foraging habitat would not be expected. Stationary structures in the offshore environment would not be expected to pose a collision risk to birds. Some birds like cormorants and gulls may be attracted to these structures and opportunistically roost on these structures.	The installation of future new structures in the marine or onshore environment over the next 34 years would not be expected to cause an increase in collision risk or to result in displacement. Some potential for attraction and opportunistic roosting exists but would be expected to be limited given the anticipated number of structures.
Traffic: Aircraft	General aviation accounts for approximately two bird strikes per 100,000 flights (Dolbeer et al. 2019). In addition to general aviation, aircraft are used for scientific and academic surveys in marine environments.	Bird fatalities associated with general aviation would be expected to increase with the current trend in commercial air travel. Aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and pre-construction surveys. These flights would be well below the 100,000 flights and no bird strikes would be expected to occur.
Associated IPFs: Sub-IPFs	**Ongoing Activities**	**Future Non-Offshore Wind Activities Intensity/Extent**
Land disturbance: Onshore construction	Onshore construction activity would continue at current trends. There is some potential for indirect impacts associated with habitat loss and fragmentation.	Future non-offshore wind development would continue to occur at the current rate. This development has the potential to result in habitat loss but would not be expected to result in injury or mortality of individuals.

Climate change: Warming and sea level rise, storm severity/frequency	Increased storm frequency and severity during the breeding season can reduce productivity of bird nesting colonies and kill adults, eggs, and chicks	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Climate change: Ocean acidification	Increasing ocean acidification may affect prey species upon which some birds feed and could lead to shifts in prey distribution and abundance. Intensity of impacts on birds is speculative.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Climate change: Warming and sea level rise, altered habitat/ecology	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 35 years, influencing the distribution of bird prey resources.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Climate change: Warming and sea level rise, altered migration patterns	Birds rely on cues from the weather to start migration. Wind direction and speed influence the amount of energy used during migration. For nocturnal migrants, wind assistance is projected to increase across eastern portions of the continent (0.32 m/s; 9.6%) during spring migration by 2091, and wind assistance is projected to decrease within eastern portions of the continent (0.17 m/s; 6.6%) during autumn migration (La Sorte et al. 2018).	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Climate change: Warming and sea level rise, protective measures (barriers, seawalls)	The proliferation of coastline protections have the potential to result in long-term, high-consequence, impacts on bird nesting habitat.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Climate change: Warming and sea level rise, increased disease frequency	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 35 years, influencing the frequencies and distributions of various diseases of birds.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.

hazmat = hazardous materials

Table E1-5 Summary of Activities and the Associated Impact-Producing Factors for Coastal Habitat and Fauna

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	Accidental releases of fuel/fluids/hazmat have the potential to cause habitat contamination and harm to the species that build biogenic coastal habitats (e.g., eelgrass, oysters, mussels, slipper limpets, salt marsh cordgrass) from releases and cleanup activities. Only a portion of the ongoing releases contact coastal habitats in the geographic analysis area. Impacts are small, localized, and short-term.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
Accidental releases: Trash and debris	Ongoing releases of trash and debris occur from onshore sources, fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, and lines and pipeline laying. As population and vessel traffic increase, accidental releases of trash and debris may increase. Such materials may be obvious when they come to rest on shorelines; however, there does not appear to be evidence that the volumes and extents would have any detectable impact on coastal habitats.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
Anchoring	Vessel anchoring related to ongoing military, survey, commercial, and recreational activities would continue to cause short-term to permanent impacts in the immediate area where anchors and chains meet the seafloor. These impacts include increased turbidity levels and potential for direct contact to cause physical damage to coastal habitats. All impacts are localized, turbidity is short term and short-term, and physical damage can be permanent if it occurs in eelgrass beds or hard bottom.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
EMF	EMFs continuously emanate from existing telecommunication and electrical power transmission cables. New cables generating EMFs are infrequently installed in the geographic analysis area. The extent of impacts is likely fewer than 50 feet from the cable, and the intensity of impacts on coastal habitats is likely undetectable.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
Land disturbance:	Periodic ground-disturbing activities contribute to elevated levels of erosion and sedimentation, but usually not to a degree	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Erosion and sedimentation	that affects terrestrial and coastal fauna, assuming that industry standard BMPs are implemented.	
Land disturbance: Onshore construction	Periodic clearing of shrubs and tree saplings along existing utility rights-of-way causes disturbance and short-term displacement of mobile species and may cause direct injury or mortality of less-mobile species, resulting in short-term impacts that are less than noticeable. Continual development of residential, commercial, industrial, solar, transmission, gas pipeline, onshore wind turbine, and cell tower projects also causes disturbance, displacement, and potential injury or mortality of fauna, resulting in small, short-term impacts.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance: Onshore, land use changes	Periodically, undeveloped parcels are cleared and developed for human uses, permanently changing the condition of those parcels as habitat for terrestrial fauna. Continual development of residential, commercial, industrial, solar, transmission, gas pipeline, onshore wind turbine, transportation infrastructure, sewer infrastructure, and cell tower projects could permanently convert various areas.	No future activities were identified within the geographic analysis area other than ongoing activities.
Light: Vessels	Navigation lights and deck lights on vessels would be a source of ongoing light. The extent of impacts is limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats is likely undetectable.	Light is expected to continue to increase gradually with increasing vessel traffic over the next 34 years. The extent of impacts would likely be limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats would likely be undetectable.
Light: Structures	Ongoing lights from navigational aids and other structures occur onshore and nearshore. The extent of impacts is likely limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats is likely undetectable.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
New cable emplacement/ maintenance	Ongoing cable maintenance activities infrequently disturb bottom sediments; these disturbances are localized and limited to the emplacement corridor (see the sediment deposition and burial IPF).	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Onshore/ offshore construction	Ongoing noise from construction occurs frequently near shores of populated areas in New England and the Mid-Atlantic, but infrequently offshore. Noise from construction near shore is expected to gradually increase over the next 34 years in line with human population growth along the coast of the geographic analysis area. The intensity and extent of noise from construction are difficult to generalize, but impacts are localized and short-term.	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: G&G	Site characterization surveys and scientific surveys are ongoing. The intensity and extent of the resulting impacts are difficult to generalize but are localized and short-term.	Site characterization surveys, scientific surveys, and exploratory oil and gas surveys are anticipated to occur infrequently over the next 34 years. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely localized and short-term.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water or through the seabed can reach coastal habitats. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: Cable laying/ trenching	Rare but ongoing trenching for pipeline and cable-laying activities emits noise; cable burial via jet embedment also causes similar noise impacts. These disturbances are short-term and localized and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on coastal habitats are discountable compared to the impacts of the physical disturbance and sediment suspension.	New or expanded submarine cables and pipelines may occur in the geographic analysis area infrequently over the next 34 years. These disturbances would be short-term and localized and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on coastal habitats are discountable compared to the impacts of the physical disturbance and sediment suspension.
Presence of structures: Habitat conversion	Various structures, including pilings, piers, towers, riprap, buoys, and various means of hard protection, are periodically added to the seascape, creating uncommon relief in a mostly flat seascape and converting previously existing habitat (whether hard-bottom or soft-bottom) to a type of hard habitat, although it differs from the typical hard-bottom habitat in the geographic analysis area, namely, coarse substrates in a	Any new cable or pipeline installed in the geographic analysis area would likely require hard protection atop portions of the route. Such protection is anticipated to increase incrementally over the next 34 years. Where cables would be buried deeply enough that protection would not be used, presence of the cable would have no impact on coastal habitats.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	sand matrix. The new habitat may or may not function similarly to hard-bottom habitat typical in the region (Kerckhof et al. 2019; HDR 2019). Soft bottom is the dominant habitat type on the OCS, and structures do not meaningfully reduce the amount of soft-bottom habitat available (Guida et al. 2017; Greene et al. 2010). Structures can also create an artificial reef effect, attracting a different community of organisms.	
Presence of structures: Transmission cable infrastructure	Various means of hard protection atop existing cables can create uncommon hard-bottom habitat. Where cables are buried deeply enough that protection is not used, presence of the cable has no impact on coastal habitats.	Any new cable or pipeline installed in the geographic analysis area would likely require hard protection atop portions of the route. Such protection is anticipated to increase incrementally over the next 34 years. Where cables would be buried deeply enough that protection would not be used, presence of the cable would have no impact on coastal habitats.
Land disturbance: Erosion and sedimentation	Ongoing development of onshore properties, especially shoreline parcels, periodically causes short-term erosion and sedimentation of coastal habitats.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance: Onshore construction	Ongoing development of onshore properties, especially shoreline parcels, periodically causes short-term to permanent degradation of onshore coastal habitats.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance: Onshore, land use changes	Ongoing development of onshore properties, especially shoreline parcels, periodically causes the conversion of onshore coastal habitats to developed space.	No future activities were identified within the geographic analysis area other than ongoing activities.
New cable emplacement/ maintenance: Seabed profile alterations	Ongoing sediment dredging for navigation purposes results in localized, short-term impacts on coastal habitats through this IPF. Dredging typically occurs only in sandy or silty habitats, which are abundant in the geographic analysis area and are quick to recover from disturbance. Therefore, such impacts, while locally intense, have little effect on the general character of coastal habitats.	No future activities were identified within the geographic analysis area other than ongoing activities.
Cable emplacement/ maintenance: Sediment deposition and burial	Ongoing sediment dredging for navigation purposes results in fine sediment deposition within coastal habitats. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are localized, limited to the emplacement corridor.	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	No dredged material disposal sites were identified within the geographic analysis area.	
Climate change: Ocean acidification	Ongoing CO2 emissions causing ocean acidification may contribute to reduced growth or the decline of reefs and other habitats formed by shells.	No future activities were identified within the geographic analysis area other than ongoing activities
Climate change: Warming and sea level rise, altered habitat/ecology	Climate change, influenced in part by ongoing GHG emissions, is expected to continue to contribute to a widespread loss of shoreline habitat from rising seas and erosion. In submerged habitats, warming is altering ecological relationships and the distributions of ecosystem engineer species, likely causing permanent changes of unknown intensity gradually over the next 3 years.	No future activities were identified within the geographic analysis area other than ongoing activities

hazmat = hazardous materials

Table E1-6 Summary of Activities and the Associated Impact-Producing Factors for Commercial Fisheries and For-Hire Recreational Fishing

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring	Impacts from anchoring occur due to ongoing military, survey, commercial, and recreational activities. The short-term, localized impact on this resource is the presence of a navigational hazard (anchored vessel) to fishing vessels.	Impacts from anchoring may occur on a semi-regular basis over the next 34 years due to offshore military operations, survey activities, commercial vessel traffic, and recreational vessel traffic. Anchoring could pose a short-term (hours to days), localized (within a few hundred meters of anchored vessel) navigational hazard to fishing vessels.
New cable emplacement/ maintenance	New cable emplacement and infrequent cable maintenance activities disturb the seafloor, increase suspended sediment, and cause short-term displacement of fishing vessels. These disturbances would be localized and limited to the emplacement corridor.	Future new cables and cable maintenance would occasionally disturb the seafloor and cause short-term displacement in fishing vessels and increases in suspended sediment resulting in localized, short-term impacts. If the cable routes enter the geographic analysis area for this resource, short-term disruption of fishing activities would be expected.
Noise: Construction, trenching, O&M	Noise from construction occurs frequently in coastal habitats in populated areas in New England and the Mid-Atlantic, but infrequently offshore. The intensity and extent of noise from construction are difficult to generalize, but impacts are localized and short-term. Infrequent offshore trenching could occur in connection with cable installation. These disturbances are short-term and localized, and extend only a short distance beyond the emplacement corridor. Low levels of elevated noise from operational WTGs are likely have low to no impacts on fish and no impacts at a fishery level. Noise is also created by O&M of marine minerals extraction, which has small, localized impacts on fish, but likely no impacts at a fishery level.	Noise from construction near shore is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource. Noise from dredging and sand and gravel mining could occur. New or expanded marine minerals extraction may increase noise during their O&M over the next 34 years. Impacts from construction, operations, and maintenance would likely be small and localized on fish, and not seen at a fishery level. Periodic trenching would be needed for repair or new installation of underground infrastructure. These disturbances would be short-term and localized, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on commercial fish species are typically less prominent than the impacts of the physical disturbance and sediment suspension. Therefore, fishery-level impacts are unlikely.
Noise: G&G	Ongoing site characterization surveys and scientific surveys produce noise around sites of investigation. These activities can disturb fish and invertebrates in the immediate vicinity of the investigation and can cause short-term behavioral changes. The extent depends on equipment used, noise levels, and local acoustic conditions.	Site characterization surveys, scientific surveys, and exploratory oil and gas surveys are anticipated to occur infrequently over the next 34 years. Seismic surveys used in oil and gas exploration create high-intensity impulsive noise to penetrate deep into the seabed, potentially resulting in injury or mortality to finfish and invertebrates in a small area around each sound source and short-term stress and behavioral changes to individuals over a greater

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
		area. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves more similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely localized and short-term.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when ports or marinas, piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water or through the seabed can cause injury or mortality of finfish and invertebrates in a small area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area, leading to short-term, localized impacts on commercial fisheries and for-hire recreational fishing. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: Vessels	Vessel noise is anticipated to continue at levels similar to current levels. While vessel noise may have some impact on behavior, it is likely limited to brief startle and short-term stress responses. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	Planned new barge route and dredging disposal sites would generate vessel noise when implemented.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 34 years.	Ports would need to perform maintenance and upgrades to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size. Port utilization is expected to increase over the next 34 years, with increased activity during construction. The ability of ports to receive the increase in vessel traffic may require port modifications, such as channel deepening, leading to localized impacts on fish populations. Port expansions could also increase vessel traffic and competition for dockside services, which could affect fishing vessels.
Presence of structures: Navigation hazard and allisions	Structures within and near the cumulative lease areas that pose potential navigation hazards include offshore wind turbines, buoys, and shoreline developments such as docks and ports. An allision occurs when a moving vessel	No known reasonably foreseeable structures are proposed to be located in the geographic analysis area that could affect commercial fisheries. Vessel allisions with non-offshore wind stationary objects should not increase

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. Two types of allisions occur: drift and powered. A drift allision generally occurs when a vessel is powered down due to operator choice or power failure. A powered allision generally occurs when an operator fails to adequately control their vessel movements or is distracted.	meaningfully without a substantial increase in vessel congestion.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb habitats and potentially harm individuals, creating small, localized, short-term impacts on fish, but likely no impacts at a fishery level.	No future activities were identified within the geographic analysis area other than ongoing activities.
Presence of structures: Habitat conversion and fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables, create uncommon relief in a mostly sandy seascape. A large portion is homogeneous sandy seascape but there is some other hard or complex habitat. Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat. Structure-oriented fishes are attracted to these locations. These impacts are localized and can be short term to permanent. Fish aggregation may be considered adverse, beneficial, or neutral. Commercial and for-hire recreational fishing can occur near these structures. For-hire recreational fishing is more popular, as commercial mobile fishing gear risks snagging on the structures.	New cables, installed incrementally in the geographic analysis area over the next 20 to 34 years, would likely require hard protection atop portions of the route (see Cable emplacement/maintenance IPF above). Any new towers, buoys, or piers would also create uncommon relief in a mostly flat seascape. Structure-oriented species could be attracted to these locations and would benefit (Claisse et al. 2014; Smith et al. 2016). This may lead to more and larger structure-oriented fish communities and larger predators opportunistically feeding on the communities, as well as increased private and for-hire recreational fishing opportunities. Soft bottom is the dominant habitat type in the region, and species that rely on this habitat would not likely experience population-level impacts (Guida et al. 2017; Greene et al. 2010). These impacts are expected to be localized and may be long term.
Presence of structures: Migration disturbances	Human structures in the marine environment (e.g., shipwrecks, artificial reefs, buoys, and oil platforms) can attract finfish and invertebrates that approach the structures during their migrations. This could slow species migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement than structure (Secor et al. 2018). There is no evidence to suggest that structures pose a barrier to migratory animals.	The infrequent installation of future new structures in the marine environment over the next 34 years may attract finfish and invertebrates that approach the structures during their migrations. This could tend to slow migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement (Secor et al. 2018). Migratory animals would likely be able to proceed from structures unimpeded. Therefore, fishery-level impacts are not anticipated.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Space-use conflicts	Current structures do not result in space-use conflicts.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Presence of structures: Cable infrastructure	The existing offshore cable infrastructure supports the economy by transmitting electric power and communications between mainland and islands. Shoreline developments are ongoing and include docks, ports, and other commercial, industrial, and residential structures.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Traffic: Vessels and vessel collisions	No substantial changes are anticipated to the vessel traffic volumes. The geographic analysis area would continue to have numerous ports and the extensive marine traffic related to shipping, fishing, and recreation would continue to be important to the region's economy. The region's substantial marine traffic may result in occasional collisions. Vessels need to navigate around structures to avoid allisions. When multiple vessels need to navigate around a structure, then navigation is more complex, as the vessels need to avoid both the structure and each other. The risk for collisions is ongoing but infrequent.	New vessel traffic in the geographic analysis area would consistently be generated by proposed barge routes and dredging demolition sites. Marine commerce and related industries would continue to be important to the regional economy.
Climate change	Impacts to commercial fisheries and for-hire recreational fishing are expected to result from climate change events such as increased magnitude or frequency of storms, shoreline changes, ocean acidification, and water temperature changes. Risks to fisheries associated with these events include habitat/distribution shifts, disease incidence, and risk of invasive species. If these risk factors result in a decrease in catch and/or an increase in fishing costs (e.g., transiting time), the profitability of businesses engaged in commercial fisheries and for-hire recreational fishing would be adversely affected. While climate change is predicted to have adverse impacts on the distribution and/or productivity of some stocks targeted by commercial fisheries and for-hire recreational fishing, other stocks may be beneficially affected. The economies of communities reliant on marine species that are vulnerable to the effects of climate change could be adversely affected. If the distribution of important stocks	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	changes, it could affect where commercial and for-hire recreational fisheries are located. Furthermore, coastal communities with fishing businesses that have infrastructure near the shore could be adversely affected by sea level rise.	
Regulated fishing effort	Commercial and recreational regulations for finfish and shellfish implemented and enforced by NMFS and coastal states, affect how the commercial and for-hire recreational fisheries operate. Commercial and recreational for-hire fisheries are managed by FMPs, which are established to manage fisheries to avoid overfishing through catch quotas, special management areas, and closed area regulations. These can reduce or increase the size of available landings to commercial and for-hire recreational fisheries. For example, ongoing fishing restrictions designed to rebuild depleted stocks in the Northeast Multispecies (large-mesh) fishery would continue to reduce landings in that fishery.	Reasonably foreseeable fishery management actions include measures to reduce the risk of interactions between fishing gear and the NARW by 60% (McCreary and Brooks 2019). This would likely have a have a major adverse impact on fishing effort in the lobster and Jonah crab fisheries in the geographic analysis area for this resource. As discussed in Karp et al. (2019), changing climate and ocean conditions and the resultant effects on species distributions and productivity can have significant effects on management decisions, such as allocation, spatiotemporal closures, stock status determinations, and catch limits.

Table E1-7 Summary of Activities and the Associated Impact-Producing Factors for Cultural Resources

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	Accidental releases of fuel/fluids/hazmat occur during vessel use for recreational, fisheries, marine transportation, or military purposes, and other ongoing activities. Both released fluids and cleanup activities that require the removal of contaminated soils or seafloor sediments can cause impacts on cultural resources because resources are affected by the released chemicals as well as the ensuing cleanup activities.	Gradually increasing vessel traffic over the next 34 years would increase the risk of accidental releases within the geographic analysis area for cultural resources, increasing the frequency of small releases. Although the majority of anticipated accidental releases would be small, resulting in small-scale impacts on cultural resources, a single, large-scale accidental release such as an oil spill could have significant impacts on marine and coastal cultural resources. A large-scale release would require extensive cleanup activities to remove contaminated materials, resulting in damage to or complete removal of terrestrial and marine cultural resources. In addition, the accidentally

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
		released materials in deep-water settings could settle on seafloor cultural resources such as wreck sites, accelerating their decomposition or covering them and making them inaccessible/unrecognizable to researchers, resulting in a significant loss of historic information. As a result, although considered unlikely, a large-scale accidental release and associated cleanup could result in permanent, geographically extensive, and large-scale impacts on cultural resources.
Accidental releases: Trash and debris	Accidental releases of trash and debris occur during vessel use for recreational, fisheries, marine transportation, or military purposes and other ongoing activities. While the released trash and debris can directly affect cultural resources, the majority of impacts associated with accidental releases occur during cleanup activities, especially if soil or sediment removed during cleanup affect known and undiscovered archaeological resources. In addition, the presence of large amounts of trash on shorelines or the ocean surface can affect the cultural value of TCPs for stakeholders. State and federal laws prohibiting large releases of trash would limit the size of any individual release and ongoing local, state, and federal efforts to clean up trash on beaches and waterways would continue to mitigate the effects of small-scale accidental releases of trash.	Future activities with the potential to result in accidental releases include construction and operations of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications). Accidental releases would continue at current rates along the Northeast Atlantic coast.
Anchoring	The use of vessel anchoring and gear (i.e., wire ropes, cables, chain, sweep on the seafloor) that disturbs the seafloor, such as bottom trawls and anchors, by military, recreational, industrial, and commercial vessels can affect cultural resources by physically damaging maritime archaeological resources such as shipwrecks and debris fields.	Future activities with the potential to result in anchoring/gear utilization include construction and operations of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); military use; marine transportation; fisheries use and management; and oil and gas activities. These activities are likely to continue to occur at current rates along the entire coast of the eastern United States.
Gear utilization: Dredging	Activities associated with dredge operations and activities could damage marine archaeological resources. Ongoing activities identified by BOEM with the	Dredging activities would gradually increase through time as new offshore infrastructure is built, such as gas pipelines

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	potential to result in dredging impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities.	and electrical lines, and as ports and harbors are expanded or maintained.
Light: Vessels	Light associated with military, commercial, or construction vessel traffic can temporarily affect coastal historic structures and TCP resources when the addition of intrusive, modern lighting changes the physical environment ("setting") of cultural resources. The impacts of construction and operational lighting would be limited to cultural resources on the shoreline for which a nighttime sky is a contributing element to historic integrity. This excludes resources that are closed at night, such as historic buildings, lighthouses, and battlefields, and resources that generate their own nighttime light, such as historic districts. Offshore construction activities that require increased vessel traffic, construction vessels stationed offshore, and construction area lighting for prolonged periods can cause more sustained and significant visual impacts on coastal historic structure and TCP resources.	Future activities with the potential to result in vessel lighting impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities. Light pollution from vessel traffic would continue at the current intensity along the Northeast coast, with a slight increase due to population increase and development over time.
Light: Structures	The construction of new structures that introduce new light sources into the setting of historic architectural properties or TCPs can result in impacts, particularly if the historic or cultural significance of the resource is associated with uninterrupted nighttime skies or periods of darkness. Any tall structure (e.g., commercial building, radio antenna, large satellite dishes) requiring nighttime hazard lighting to prevent aircraft collision can cause these types of impacts.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
Port utilization: Expansion	Major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing	Future activities with the potential to result in port expansion impacts include construction and operation of undersea

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	continual upgrades and maintenance. Expansion of port facilities can introduce large, modern port infrastructure into the viewsheds of nearby historic properties, affecting their setting and historic significance.	transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities. Port expansion would continue at current levels, which reflect efforts to capture business associated with the offshore wind industry (irrespective of specific projects).
Presence of structures	The only existing offshore structures within the viewshed of the geographic analysis area are minor features such as buoys.	Non-offshore wind structures that could be viewed would be limited to meteorological towers. Marine activity would also occur within the marine viewshed of the geographic analysis area.
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and could cause impacts on submerged archaeological resources. These disturbances would be localized and limited to emplacement corridors.	Future activities with the potential to result in seafloor disturbances similar to offshore impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; and oil and gas activities. Such activities could cause impacts on submerged archaeological resources including shipwrecks and formerly subaerially exposed pre-contact Native American archaeological sites.
Land disturbance: Onshore construction	Onshore construction activities can affect archaeological resources by damaging or removing resources.	Future activities that could result in terrestrial land disturbance impacts include onshore residential, commercial, industrial, and military development activities in the central Atlantic, particularly those proximate to offshore ECCs and interconnection facilities. Onshore construction would continue at current rates.
Climate change: Warming and sea level rise, storm severity/frequency	Sea level rise and increased storm severity and frequency would result in impacts on archaeological, architectural, and TCP resources. Increased storm frequency and severity would also result in damage to and/or destruction of architectural properties. Sea level rise would increase erosion-related impacts on archaeological and architectural resources, while sea level	Sea level rise and storm severity/frequency would increase due to the effects of climate change.

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	rise would inundate archaeological, architectural, and TCP resources.	
Climate change: Warming and sea level rise, altered habitat/ecology	Altered habitat/ecology related to warming seas and sea level rise would impact the ability of Native Americans and other communities to use maritime TCPs for traditional fishing, shell fishing, and fowling activities.	The rate of change to habitats/ecology would increase as a result of climate change.
Climate change: Warming and sea level rise, altered migration patterns	Altered migration patterns related to warming seas and sea level rise would impact the ability of Native Americans and other communities to use maritime TCPs for traditional fishing, shell fishing, and fowling activities.	The rate of change to migratory animal patterns would increase as a result of climate change.
Climate change: Warming and sea level rise, property/ infrastructure damage	Sea level rise and increased storm severity and frequency would result in impacts on archaeological, architectural, and TCP resources. Increased storm frequency and severity would result in damage to and/or destruction of architectural properties. Sea level rise would increase erosion-related impacts on archaeological and architectural resources while sea level rise would inundate archaeological, architectural, and TCP resources.	The rate of property and infrastructure damage would increase as a result of climate change.
Climate change: Warming and sea level rise, protective measures (barriers, sea walls)	The installation of protective measures such as barriers and sea walls would impact archaeological resources during associated ground-disturbing activities. Construction of these modern protective structures would alter the viewsheds from historic properties and/or TCPs, resulting in impacts on the historic and/or cultural significance of resources.	The installation of coastal protective measures would increase as a result of climate change.
Climate change: Warming and sea level rise, storm severity/frequency, sediment erosion, deposition	Sea level rise and increased storm severity and frequency would result in impacts on archaeological, architectural, and TCP resources. Increased storm frequency and severity would result in damage to and/or destruction of architectural properties. Sea level rise would increase erosion related impacts on archaeological and architectural resources while sea level rise would inundate archaeological, architectural, and TCP resources.	Sea level rise and storm severity/frequency would increase due to the effects of climate change.

hazmat = hazardous materials

Table E1-8 Summary of Activities and the Associated Impact-Producing Factors for Demographics, Employment, and Economics

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Light: Structures	Offshore buoys and towers emit low-intensity light, while onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
Light: Vessels	Ocean vessels have an array of lights including navigational lights and deck lights.	Anticipated modest growth in vessel traffic would result in some growth in the nighttime traffic of vessels with lighting.
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and cause short-term increases in suspended sediment; these disturbances would be localized and limited to emplacement corridors. There are existing power cables in the geographic analysis area for demographics, employment, and economics.	Future new cables would disturb the seafloor and cause short-term increases in suspended sediment resulting in infrequent, localized, short-term impacts over the next 34 years.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are short-term and localized, and extend only a short distance beyond the work area.	No future activities were identified within the geographic analysis area for demographics, employment, and economics other than ongoing activities.
Noise: Cable laying/trenching	Infrequent trenching for pipeline and cable-laying activities emit noise. These disturbances are short-term and localized, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	Periodic trenching would be needed over the next 34 years for repair or new installation of underground infrastructure.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Planned new barge route and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing continual upgrades and maintenance. The New Jersey Wind Port is being developed and the Port of Paulsboro is being upgraded specifically to support the construction of offshore wind energy facilities.	Ports would need to perform maintenance and upgrade facilities over the next 34 years to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Port utilization: Maintenance/ dredging	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. As ports expand, maintenance dredging of shipping channels is expected to increase.	Ports would need to perform maintenance and upgrades over the next 34 years to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Presence of structures: Allisions	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. The likelihood of allisions is expected to continue at or near current levels.	Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. Such loss and damage are direct costs for gear owners and are expected to continue at or near current levels.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables, create uncommon relief in a mostly flat seascape. Structure-oriented fishes are attracted to these locations, which may be known as FADs. Recreational and commercial fishing can occur near the FADs, although recreational fishing is more popular, because commercial mobile fishing gear is more likely to snag on FADs.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Habitat conversion	Structures, including foundations, scour protection around foundations, and various means of hard protection atop cables, create uncommon relief in a mostly flat seascape. Structure-oriented species thus benefit on a constant basis.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, because vessels need to avoid both the structure and each other.	Vessel traffic, overall, is not expected to meaningfully increase over the next 34 years. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space-use conflicts	Current structures do not result in space-use conflicts.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Viewshed	No existing offshore structures are within the viewshed of the offshore wind lease area except buoys.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Transmission cable infrastructure	The existing offshore cable infrastructure supports the economy by transmitting electric power and communications between mainland and islands. Additional communication cables run between the U.S. East Coast and European countries along the eastern Atlantic.	No known proposed structures not associated with offshore wind development are reasonably foreseeable.
Traffic: Vessels	Ports and marine traffic related to shipping, fishing, and recreation are important to the region's economy. No substantial changes are anticipated to existing vessel traffic volumes.	New vessel traffic near the geographic analysis area would be generated by proposed barge routes and dredging demolition sites over the next 34 years. Marine commerce and related industries would continue to be important to the geographic analysis area economy.
Traffic: Vessel collisions	The region's substantial marine traffic may result in occasional vessel collisions, which would result in costs to the vessels involved. The likelihood of collisions is expected to continue at or near current rates.	No substantial changes anticipated.
Land disturbance: Onshore construction	Onshore development activities support local population growth, employment, and economies. Disturbances can cause short-term, localized traffic delays and restricted access to adjacent properties. The rate of onshore land disturbance is expected to continue at or near current rates.	Onshore development projects would be ongoing in accordance with local government land use plans and regulations.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Climate change	Climate models predict climate change if current trends continue. Climate change has adverse implications for demographics and economic health of coastal communities, due in part to the costs of resultant damage to property and infrastructure, fisheries and other natural resources, increased disease frequency, and sedimentation, among other factors.	Onshore projects that reduce air emissions could contribute to the effort to limit climate change. Onshore solar and wind energy projects, although producing less energy than potential offshore wind developments, would also provide incremental reductions.
Regulated Fishing Effort	Commercial and recreational regulations for finfish and shellfish implemented and enforced by NMFS and coastal states affect how commercial and for-hire recreational fisheries operate. Commercial and recreational for-hire fisheries are managed by FMPs, which are established to manage fisheries to avoid overfishing through catch quotas, special management areas, and closed area regulations. These can reduce or increase the size of available landings to commercial and for-hire recreational fisheries.	Reasonably foreseeable fishery management actions include measures to reduce the risk of interactions between fishing gear and the NARW by 60% (McCreary and Brooks 2019). This would likely have a significant impact on fishing effort in the lobster and Jonah crab fisheries in the geographic analysis area for this resource.

FAD = fish aggregating device

Table E1-9 Summary of Activities and the Associated Impact-Producing Factors for Environmental Justice

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Air emissions: Construction/ decommissioning	Ongoing population growth and new development within the geographic analysis area is likely to increase traffic, with resulting increases in emissions from motor vehicles. Some new industrial development may result in emission-producing uses. At the same time, many industrial waterfront areas near environmental justice communities are losing industrial uses and converting to more commercial or residential uses.	New development may include emission-producing industry and new development that would increase emissions from motor vehicles. Some historically industrial waterfront locations would continue to lose industrial uses, with no new industrial development to replace it.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Air emissions: O&M	Ongoing population growth and new development within the geographic analysis area is likely to increase traffic, with resulting increase in emissions from motor vehicles. Some new industrial development may result in emission-producing uses. At the same time, many industrial waterfront areas near environmental justice communities are losing industrial uses and converting to more commercial or residential uses.	New development may include emission-producing industry and new development that would increase emissions from motor vehicles. Some historically industrial waterfront locations would continue to lose industrial uses, with no new industrial development to replace it.
Light: Structures	Offshore buoys and towers emit low-intensity light, while onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and cause short-term increases in suspended sediment; these disturbances would be localized and limited to emplacement corridors.	Future new cables would disturb the seafloor and cause short-term increases in suspended sediment, resulting in infrequent, localized, short-term impacts over the next 34 years.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are short-term and localized, and extend only a short distance beyond the work area.	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: Trenching	Infrequent trenching for pipeline and cable-laying activities emits noise. These disturbances are short-term and localized, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	Periodic trenching would be needed over the next 34 years for repair or new installation of underground infrastructure.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	Vessel noise is anticipated to continue at or near current levels.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing continual upgrades and maintenance. The New Jersey Wind Port is being developed and the Port of Paulsboro is being upgraded specifically to support the construction of offshore wind energy facilities.	Ports would need to perform maintenance and upgrade facilities to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Presence of structures: Entanglement, gear loss/ damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. Such loss and damage are direct costs for gear owners and are expected to continue at or near current levels.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, because vessels need to avoid both the structure and each other.	Vessel traffic is generally not expected to meaningfully increase over the next 34 years. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space-use conflicts	Current structures do not result in space-use conflicts.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Viewshed	There are no existing offshore structures within the viewshed of the offshore wind lease area except buoys.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Cable infrastructure	Existing submarine cables cross cumulative lease areas.	Existing cable O&M activities would continue within the geographic analysis area.
Traffic: Vessels	Ports and marine traffic related to shipping, fishing, and recreation are important to the region’s economy. No substantial changes are anticipated to existing vessel traffic volumes.	Vessel traffic is not expected to meaningfully increase over the next 34 years. Marine commerce and related industries would continue to be important to area employment.
Land disturbance: Erosion and sedimentation	Potential erosion and sedimentation from development and construction are controlled by local and state development regulations.	New development activities would be subject to erosion and sedimentation regulations.
Land disturbance: Onshore construction	Onshore development supports local population growth, employment, and economics.	Onshore development would continue in accordance with local government land use plans and regulations.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Land disturbance: Onshore, land use changes	Onshore development would result in changes in land use in accordance with local government land use plans and regulations.	Development of onshore solar and wind energy would provide diversified, small-scale energy generation.
Climate change	Climate models predict climate change if current trends continue. Climate change has adverse implications for demographics and the economic health of coastal communities, due in part to the costs of resultant damage to property and infrastructure, fisheries, and other natural resources; increased disease frequency; and sedimentation, among other factors.	Onshore projects that reduce air emissions could contribute to the effort to limit climate change. Onshore solar and wind energy projects, although producing less energy than potential offshore wind developments, would also provide incremental reductions.
Regulated fishing effort	Commercial and recreational regulations for finfish and shellfish implemented and enforced by NMFS and coastal states affect how commercial and for-hire recreational fisheries operate. Commercial and recreational for-hire fisheries are managed by FMPs, which are established to manage fisheries to avoid overfishing through catch quotas, special management areas, and closed area regulations. These can reduce or increase the size of available landings to commercial and for-hire recreational fisheries.	Reasonably foreseeable fishery management actions include measures to reduce the risk of interactions between fishing gear and the NARW by 60% (McCreary and Brooks 2019). This would likely have a significant impact on the fishing effort in the lobster and Jonah crab fisheries in the geographic analysis area for this resource.

Table E1-10 Summary of Activities and the Associated Impact-Producing Factors for Finfish, Invertebrates, and Essential Fish Habitat

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	Ongoing releases are frequent/chronic. Impacts, including mortality, decreased fitness, and contamination of habitat, are localized and short-term, and rarely affect populations.	Gradually increasing vessel traffic over the next 34 years would increase the risk of accidental releases. Impacts are unlikely to affect populations.
Accidental releases: Invasive species	Invasive species are periodically released accidentally during ongoing activities, including the discharge of ballast water and bilge water from marine vessels. The impacts on finfish, invertebrates, and EFH depend on many factors, but can be widespread and permanent.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Anchoring	Vessel anchoring related to ongoing military use and survey, commercial, and recreational	Impacts from anchoring may occur on a semi-regular basis over the next 34 years due to

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	activities continue to cause short-term to permanent impacts in the immediate area where anchors and chains meet the seafloor. Impacts on finfish, invertebrates, and EFH are greatest for sensitive EFH (e.g., eelgrass, hard bottom) and sessile or slow-moving species (e.g., corals, sponges, and sedentary shellfish).	offshore military operations, survey activities, commercial vessel traffic, and recreational vessel traffic. These impacts would include increased turbidity levels and potential for direct contact causing mortality of benthic species and, possibly, degradation of sensitive habitats. All impacts would be localized, turbidity would be short-term, and impacts from direct contact would be recovered in the short term. Degradation of sensitive habitats such as certain types of hard bottom (e.g., boulder piles), if it occurs, could be long term.
EMF	EMF emanates continuously from installed telecommunication and electrical power transmission cables. Biologically significant impacts on finfish, invertebrates, and EFH have not been documented for AC cables (CSA Ocean Sciences, Inc. and Exponent 2019; Thomsen et al. 2015), but behavioral impacts have been documented for benthic species (skates and lobster) near operating DC cables (Hutchison et al. 2018). The impacts are localized and affect the animals only while they are within the EMF. There is no evidence to indicate that EMF from undersea AC power cables negatively affects commercially and recreationally important fish species (CSA Ocean Sciences, Inc. and Exponent 2019).	During operation, future new cables would produce EMF. Submarine power cables in the geographic analysis area are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels. Although the EMF would exist as long as a cable was in operation, impacts on finfish, invertebrates, and EFH would likely be difficult to detect.
Light: Vessels	Marine vessels have an array of lights including navigational lights and deck lights. There is little downward-focused lighting, and therefore only a small fraction of the emitted light enters the water. Light can attract finfish and invertebrates, potentially affecting distributions in a highly localized area. Light may also disrupt natural cycles, e.g., spawning, possibly leading to short-term impacts.	Vessels would continue to be a light source within the geographic analysis area.
Light: Structures	Offshore buoys and towers emit light, and onshore structures, including buildings and ports, emit a great deal more on an ongoing basis. Light can attract finfish and invertebrates, potentially affecting distributions in a highly localized area. Light may also disrupt natural cycles, e.g., spawning, possibly leading to short-term impacts. Light from structures is widespread and permanent near the coast, but minimal offshore.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and cause short-term increases in suspended sediment; these disturbances are localized and limited to the cable corridor. New cables are infrequently added near shore. Cable emplacement/ maintenance activities disturb, displace, and injure finfish and invertebrates and result in short-term to long-term habitat alterations. The intensity of impacts depends on the time (season) and place (habitat type) where the activities occur. (See also the IPF of Sediment deposition and burial.)	Future new cables would occasionally disturb the seafloor and cause short-term increases in suspended sediment, resulting in localized short-term impacts. If the cable routes enter the geographic analysis area for this resource, short-term disturbance would be expected. The intensity of impacts would depend on the time (season) and place (habitat type) where the activities would occur.
Noise: Aircraft	Noise from aircraft reaches the sea surface on a regular basis. However, there is not likely to be any impact of aircraft noise on finfish, invertebrates, and EFH, as very little of the aircraft noise propagates through the water.	Aircraft noise is likely to continue to increase as commercial air traffic increases. However, there is not likely to be any impact of aircraft noise on finfish, invertebrates, and EFH.
Noise: Onshore/ offshore construction	Noise from construction occurs frequently in near shores of populated areas in New England and the mid-Atlantic but infrequently offshore. The intensity and extent of noise from construction is difficult to generalize, but impacts are localized and short-term. See also sub-IPF for Noise: Pile driving.	Noise from construction nearshore is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource.
Noise: G&G	Ongoing site characterization surveys and scientific surveys produce noise around sites of investigation. These activities can disturb finfish and invertebrates in the immediate vicinity of the investigation and can cause short-term behavioral changes. The extent depends on equipment used, noise levels, and local acoustic conditions.	Site characterization surveys, scientific surveys, and exploratory oil and gas surveys are anticipated to occur infrequently over the next 34 years. Seismic surveys used in oil and gas exploration create high-intensity, impulsive noise to penetrate deep into the seabed, potentially resulting in injury or mortality of finfish and invertebrates in a small area around each sound source and short-term stress and behavioral changes to individuals over a greater area. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves more similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely localized and short-term.
Noise: O&M	Some finfish and invertebrates may be able to hear the continuous underwater noise of operational WTGs. As measured at the Block Island Wind Farm, this low-frequency noise barely exceeds ambient levels at 164 feet (50 meters) from the WTG base. Based on the	New or expanded marine minerals extraction and commercial fisheries may intermittently increase noise during their O&M over the next 34 years. Impacts would likely be small and localized.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	results of Thomsen et al. (Thomsen et al. 2015), SPLs would be expected to be at or below ambient levels at relatively short distances (approximately 164 feet [50 meters]) from WTG foundations. These low levels of elevated noise likely have little to no impact. Noise is also created by O&M of marine minerals extraction and commercial fisheries, each of which has small, localized impacts.	
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water or through the seabed can cause injury or mortality of finfish and invertebrates in a small area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area. Eggs, embryos, and larvae of finfish and invertebrates could also experience developmental abnormalities or mortality resulting from this noise, although thresholds of exposure are not known (Weilgart 2018; Hawkins and Popper 2017). Potentially injurious noise could also be considered as rendering EFH temporarily unavailable or unsuitable for the duration of the noise. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Noise: Cable laying/ trenching	Infrequent trenching activities for pipeline and cable laying, as well as other cable burial methods, emit noise. These disturbances are short-term and localized, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	New or expanded submarine cables and pipelines are likely to occur in the geographic analysis area for this resource. These disturbances would be infrequent over the next 34 years, short-term, and localized, and would extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.
Noise: Vessels	While ongoing vessel noise may have some effect on behavior, it is likely limited to brief startle and short-term stress responses. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	Vessels would continue to be a noise source within the geographic analysis area.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 34 years.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. Certain types of vessel traffic have increased recently (e.g., ferry use, cruise industry) and may continue to increase in the foreseeable future. In addition, the general trend along the coast from Virginia to Maine is that port activity would increase modestly. The ability of ports to receive the increase may require port modifications, leading to localized impacts. Future channel-deepening activities would likely be undertaken. Existing ports have already affected finfish, invertebrates, and EFH, and future port projects would implement BMPs to minimize impacts. Although the degree of impacts on EFH would likely be undetectable outside the immediate vicinity of the ports, adverse impacts on EFH for certain species or life stages may lead to impacts on finfish and invertebrates beyond the vicinity of the port.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb habitats and potentially harm individuals, creating small, localized, short-term impacts.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Presence of structures: Hydrodynamic disturbance	Human-made structures, especially tall vertical structures such as foundations for towers of various purposes, continuously alter local water flow at a fine scale. Water flow typically returns to background levels within a relatively short distance from the structure. Therefore, impacts on finfish, invertebrates, and EFH are typically undetectable. Indirect impacts of structures influencing primary productivity and higher trophic levels are possible but are not well understood. New structures are periodically added.	Tall vertical structures can increase seabed scour and sediment suspension. Impacts would likely be highly localized and difficult to detect. Indirect impacts of structures influencing primary productivity and higher trophic levels are possible but are not well understood.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables, create uncommon relief in a mostly sandy seascape.	New cables, installed incrementally in the geographic analysis area for this resource over the next 20 to 34 years, would likely require hard protection atop portions of the route (see

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	Structure-oriented fishes are attracted to these locations. These impacts are localized and often permanent. Fish aggregation may be considered adverse, beneficial, or neutral.	the Cable emplacement/maintenance IPF). Any new towers, buoys, or piers would also create uncommon relief in a mostly sandy seascape. Structure-oriented fishes could be attracted to these locations. Abundance of certain fishes may increase. These impacts are localized and may be permanent.
Presence of structures: Habitat conversion	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables, create uncommon relief in a mostly sandy seascape. A large portion is homogeneous sandy seascape but there is some other hard or complex habitat. Structure-oriented species thus benefit on a constant basis; however, the diversity may decline over time as early colonizers are replaced by successional communities dominated by blue mussels and anemones (Degraer et al. 2019 [Chapter 7]). Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat.	New cable, installed incrementally in the geographic analysis area over the next 20 to 34 years, would likely require hard protection atop portions of the route (see new cable emplacement/maintenance). Any new towers, buoys, or piers would also create uncommon relief in a mostly sandy seascape. Structure-oriented species would benefit (Claisse et al. 2014; Smith et al. 2016); however, the diversity may decline over time as early colonizers are replaced by successional communities dominated by blue mussels and anemones (Degraer et al. 2019). Soft bottom is the dominant habitat type from Cape Hatteras to the Gulf of Maine (over 60 million acres) and species that rely on this habitat would not likely experience population-level impacts (Guida et al. 2017; Greene et al. 2010).
Presence of structures: Migration disturbances	Human structures in the marine environment (e.g., shipwrecks, artificial reefs, and oil platforms) can attract finfish and invertebrates that approach the structures during their migrations. This could slow migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement than structure is (Moser and Shepherd 2009; Fabrizio et al. 2014; Secor et al. 2018). There is no evidence to suggest that structures pose a barrier to migratory animals.	The infrequent installation of future new structures in the marine environment over the next 34 years may attract finfish and invertebrates that approach the structures during their migrations. This could tend to slow migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement (Moser and Shepherd 2009; Fabrizio et al. 2014; Secor et al. 2018). Migratory animals would likely be able to proceed from structures unimpeded.
Presence of structures: Cable infrastructure	See other sub-IPFs within the presence of structures IPF.	See other sub-IPFs within the presence of structures IPF.
Regulated fishing effort	Regulated fishing effort results in the removal of a substantial amount of the annually produced biomass of commercially regulated finfish and invertebrates and can also influence bycatch of non-regulated species. Ongoing commercial and recreational regulations for finfish and shellfish implemented and enforced	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	by states, municipalities, and/or NOAA, depending on jurisdiction, affect finfish, invertebrates, and EFH by modifying the nature, distribution and intensity of fishing-related impacts, including those that disturb the seafloor (trawling, dredge fishing).	
Seabed profile alterations	Ongoing sediment dredging for navigation purposes results in localized, short-term impacts (habitat alteration, change in complexity) on finfish, invertebrates, and EFH through this IPF. Dredging is most likely in sand wave areas where typical jet plowing is insufficient to meet target cable burial depth. Sand waves that are dredged would likely be redeposited in like-sediment areas. Any particular sand wave may not recover to the same height and width as pre-disturbance; however, the habitat function would largely recover post-disturbance. Therefore, seabed profile alterations, while locally intense, have little impact on finfish, invertebrates, and EFH on a regional (Cape Hatteras to Gulf of Maine) scale.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Sediment deposition and burial	Ongoing sediment dredging for navigation purposes results in fine sediment deposition. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are localized and limited to the emplacement corridor. Sediment deposition could have negative impacts on eggs and larvae, particularly demersal eggs such as longfin squid, which are known to have high rates of egg mortality if egg masses are exposed to abrasion or burial. Impacts may vary based on season/time of year.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Climate change: Ocean acidification	Continuous CO2 emissions causing ocean acidification may contribute to reduced growth or the decline of invertebrates that have calcareous shells over the course of the next 35 years.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Climate change: Warming and sea level rise, altered habitat, ecology, and	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 35 years, influencing the distributions of finfish, invertebrates, and EFH. This sub-IPF has been shown to affect the distribution of fish in the northeast United	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
migration patterns	States, with several species shifting their centers of biomass either northward or to deeper waters (Hare et al. 2016).	
Climate change: Warming and sea level rise, disease frequency	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 35 years, influencing the frequencies of various diseases of finfish and invertebrates.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Gear utilization	Gear employed for scientific research and monitoring surveys can disturb habitats and potentially harm individuals, creating small, localized, short-term impacts.	Future scientific research and monitoring activities are expected to continue and would not result in population-level impacts.

AC = alternating current; DC = direct current; hazmat = hazardous materials

Table E1-11 Summary of Activities and the Associated Impact-Producing Factors for Land Use and Coastal Infrastructure

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/ hazmat	Various ongoing onshore and coastal construction projects include the use of vehicles and equipment that contain fuel, fluids, and hazmat that could be released.	Ongoing onshore construction projects involve vehicles and equipment that use fuel, fluids, or hazmat could result in an accidental release. Intensity and extent would vary depending on the size, location, and materials involved in the release.
Light: Structures	Various ongoing onshore and coastal construction projects have nighttime activities, as well as existing structures, facilities, and vehicles that would use nighttime lighting.	Ongoing onshore construction projects involving nighttime activity could generate nighttime lighting. Intensity and extent would vary depending on the location, type, direction, and duration of nighttime lighting.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing continual upgrades and maintenance. The New Jersey Wind Port is being developed and the Port of Paulsboro is being upgraded specifically to support the construction of offshore wind energy facilities.	Ports would need to perform maintenance and upgrade facilities to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Presence of structures: Viewshed	The only existing offshore structures within the offshore viewshed are minor features such as buoys.	Non-offshore wind structures that could be viewed in conjunction with the offshore components would be limited to meteorological towers. Marine activity would also occur within the marine viewshed.
Presence of structures: Cable infrastructure	Onshore buried cables would only occur where permitted by local land use authorities, which would avoid long-term land use conflicts.	No known proposed structures are reasonably foreseeable and proposed to be located in the geographic analysis area for land use and coastal infrastructure.
Land disturbance: Onshore construction	Onshore construction supports local population growth, employment, and economics.	Onshore development would continue in accordance with local government land use plans and regulations.
Land disturbance: Onshore, land use changes	New development or redevelopment would result in changes in land use in accordance with local government land use plans and regulations.	Ongoing and future development and redevelopment is anticipated to reinforce existing land use patterns, based on local government planning documents.

hazmat = hazardous materials

Table E1-12 Summary of Activities and the Associated Impact-Producing Factors for Marine Mammals

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/ hazmat	Ongoing releases are frequent/chronic. Marine mammal exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality or sublethal effects on individual fitness, including adrenal effects, hematological effects, liver effects, lung disease, poor body condition, skin lesions, and several other health effects attributed to oil exposure (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008; Smith et al. 2017; Sullivan et al. 2019; Takeshita et al. 2017). Additionally, accidental releases may result in impacts on marine mammals due to effects on prey species.	Gradually increasing vessel traffic over the next 34 years would increase the risk of accidental releases. Marine mammal exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality or sublethal effects on individual fitness, including adrenal effects, hematological effects, liver effects, lung disease, poor body condition, skin lesions, and several other health effects attributed to oil exposure (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008; Smith et al. 2017; Sullivan et al. 2019; Takeshita et al. 2017). Additionally, accidental releases may result in impacts on marine mammals due to effects on prey species.
Accidental releases: Trash and debris	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines and pipeline laying, and debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low-quantity, localized, and low-impact events. Worldwide 62 of 123 (50.4%) marine mammal species have been documented ingesting marine litter (Werner et al. 2016). Stranding data indicate potential debris-induced mortality rates of 0 to 22%. Mortality has been documented in cases of debris interactions, as well as blockage of the digestive tract, disease, injury, and malnutrition (Baulch and Perry 2014). However, it is difficult to link physiological effects on individuals to population-level impacts (Browne et al. 2015).	As population and vessel traffic increase gradually over the next 34 years, accidental release of trash and debris may increase. Trash and debris may continue to be accidentally released through fisheries use and other offshore and onshore activities. There may also be a long-term risk from exposure to plastics and other debris in the ocean. Worldwide 62 of 123 (50.4%) of marine mammal species have been documented ingesting marine litter (Werner et al. 2016). Mortality has been documented in cases of debris interactions, as well as blockage of the digestive tract, disease, injury, and malnutrition (Baulch and Perry 2014).
EMF	EMFs emanate constantly from installed telecommunication and electrical power transmission cables. Marine mammals appear to have a detection threshold for magnetic intensity gradients (i.e., changes in magnetic field levels with distance) of 0.1% of the Earth’s magnetic field or about 0.05 µT (Kirschvink 1990) and are thus likely to be very sensitive to minor changes	During operation, future new cables would produce EMF. Submarine power cables in the marine mammal geographic analysis area are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels. EMF of any two sources would not overlap. Although the EMF would exist as long as a cable was in operation, impacts, if any,

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	in magnetic fields (Walker et al. 2003). There is a potential for animals to react to local variations of the geomagnetic field caused by power cable EMFs. Depending on the magnitude and persistence of the confounding magnetic field, such an effect could cause a trivial short-term change in swim direction or a longer detour during the animal's migration (Gill et al. 2005). Such an effect on marine mammals is more likely to occur with direct current cables than with AC cables (Normandeau et al. 2011). However, there are numerous transmission cables installed across the seafloor and no impacts on marine mammals have been demonstrated from this source of EMF.	would likely be difficult to detect, if they occur at all. Marine mammals have the potential to react to submarine cable EMF; however, no effects from the numerous submarine cables have been observed. Furthermore, this IPF would be limited to extremely small portions of the areas used by migrating marine mammals. As such, exposure to this IPF would be low and impacts on marine mammals would not be expected.
New cable emplacement/ maintenance	Cable maintenance activities disturb bottom sediments and cause short-term increases in suspended sediment; these disturbances would be localized and generally limited to the emplacement corridor. Data are not available regarding marine mammal avoidance of localized turbidity plumes; however, Todd et al. (2015) suggest that because some marine mammals often live in turbid waters and some species of mysticetes and sirenians employ feeding methods that create sediment plumes, some species of marine mammals have a tolerance for increased turbidity. Similarly, McConnell et al. (1999) documented movements and foraging of gray seals in the North Sea. One tracked individual was blind in both eyes, but otherwise healthy. Despite the individual's blindness, observed movements were typical of the other study individuals, indicating that visual cues are not essential for gray seal foraging and movement (McConnell et al. 1999). If elevated turbidity caused any behavioral responses such as avoidance of the turbidity zone or changes in foraging behavior, such behaviors would be short-term, and any impacts would be short-term. Turbidity associated with increased sedimentation may result in short-term impacts on marine mammal prey species.	The impact on water quality from accidental sediment suspension during cable emplacement is short-term. If elevated turbidity caused any behavioral responses such as avoidance of the turbidity zone or changes in foraging behavior, such behaviors would be short-term, and any negative impacts would be short term. Turbidity associated with increased sedimentation may result in short-term impacts on some marine mammal prey species.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Aircraft	Aircraft routinely travel in the marine mammal geographic analysis area. With the possible exception of rescue operations, no ongoing aircraft flights would occur at altitudes that would elicit a response from marine mammals. If flights are at a sufficiently low altitude, marine mammals may respond with behavioral changes, including short surface durations, abrupt dives, and percussive behaviors (i.e., breaching and tail slapping) (Patenaude et al. 2002). Similarly, aircraft have the potential to disturb hauled-out seals if aircraft overflights occur within 2,000 feet (610 meters) of a haul-out area (Efroymson et al. 2000). However, this disturbance would be short term, and result in minimal energy expenditure. These brief responses would be expected to dissipate once the aircraft has left the area.	Future low-altitude aircraft activities such as survey activities and navy training operations could result in short-term responses of marine mammals to aircraft noise. If flights are at a sufficiently low altitude, marine mammals may respond with behavioral changes, including short surface durations, abrupt dives, and percussive behaviors (i.e., breaching and tail slapping) (Patenaude et al. 2002). These brief responses would be expected to dissipate once the aircraft has left the area.
Noise: G&G	Infrequent site characterization surveys and scientific surveys produce high-intensity, impulsive noise around sites of investigation. These activities have the potential to result in high-intensity, high-consequence impacts, including auditory injuries, stress, disturbance, and behavioral responses, if marine mammals are present within the ensonified area (NOAA 2018). Survey protocols and underwater noise mitigation procedures are typically implemented to decrease the potential for any marine mammal to be within the area where sound levels are above relevant harassment thresholds associated with an operating sound source to reduce the potential for behavioral responses and injury (PTS/TTS) close to the sound source. The magnitude of effects, if any, is intrinsically related to many factors, including acoustic signal characteristics, behavioral state (e.g., migrating), biological condition, distance from the source, duration and level of the sound exposure, and environmental and physical conditions that affect acoustic propagation (NOAA 2018).	Same as ongoing activities, with the addition of possible future oil and gas exploration surveys.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Turbines	Marine mammals would be able to hear the continuous underwater noise of operational WTGs. As measured at the Block Island Wind Farm, this low-frequency noise barely exceeds ambient levels at 164 feet (50 meters) from the WTG base. Based on the results of Thomsen et al. (2015) and Kraus et al. (2016), SPLs would be expected to be at or below ambient levels at relatively short distances from the WTG foundations.	This sub-IPF does not apply to future non-offshore wind development.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water or through the seabed can result in high-intensity, low-exposure-level, long-term, but localized intermittent risk to marine mammals. Impacts would be localized in nearshore waters. Pile-driving activities may negatively affect marine mammals during foraging, orientation, migration, predator detection, social interactions, or other activities (Southall et al. 2007). Noise exposure associated with pile-driving activities can interfere with these functions and has the potential to cause a range of responses, including insignificant behavioral changes, avoidance of the ensonified area, PTS, harassment, and ear injury, depending on the intensity and duration of the exposure. BOEM assumes that all ongoing and potential future activities would be conducted in accordance with a project-specific Incidental Harassment Authorization to minimize impacts on marine mammals.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.
Noise: Cable laying/trenching	Noise from cable laying could periodically occur in the geographic analysis area.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.
Noise: Vessels	Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, scientific and academic research vessels, and other construction vessels. The frequency range for vessel noise falls within marine mammals' known range of hearing and would be audible. Noise from vessels presents a long-term and widespread	Any offshore projects that require the use of ocean vessels could potentially result in long-term but infrequent impacts on marine mammals, including short-term startle responses, masking of biologically relevant sounds, physiological stress, and behavioral changes. However, BOEM expects that these brief responses of individuals to passing vessels would be

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	impact on marine mammals across most oceanic regions. While vessel noise may have some effect on marine mammal behavior, it would be expected to be limited to brief startle and short-term stress response. Results from studies on acoustic impacts from vessel noise on odontocetes indicate that small vessels at a speed of 5 knots in shallow coastal water can reduce the communication range for bottlenose dolphins within 164 feet (50 meters) of the vessel by 26% (Jensen et al. 2009). Pilot whales in a quieter, deep-water habitat could experience a 50% reduction in communication range from a similar size boat and speed (Jensen et al. 2009). Because lower frequencies propagate farther away from the sound source compared to higher frequencies, LFCs are at a greater risk of experiencing Level B Harassment produced by vessel traffic.	unlikely given the patchy distribution of marine mammals and no stock or population-level effects would be expected.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing continual upgrades and maintenance. Port expansion activities are localized to nearshore habitats and are expected to result in short-term impacts, if any, on marine mammals. Vessel noise may affect marine mammals, but response would be expected to be short term (see vessels: noise sub-IPF above). The impacts on water quality from sediment suspension during port expansion activities is short term, and would be similar to those described under the new cable emplacement/maintenance IPF above.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity would increase modestly. The ability of ports to receive the increase in larger ships would require port modifications. Future channel-deepening activities are being undertaken to accommodate deeper-draft vessels for the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g., ferry use, cruise industry) and may continue to increase in the foreseeable future. Additional impacts associated with the increased risk of vessel strike could also occur (see the traffic: vessel collisions sub-IPF below).

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Entanglement or ingestion of lost fishing gear	There are more than 130 artificial reefs in the Mid-Atlantic region. This sub-IPF may result in long-term, high-intensity impacts, but with low exposure due to localized and geographic spacing of artificial reefs. Currently bridge foundations and the Block Island Wind Farm may be considered artificial reefs and may have higher levels of recreational fishing, which increases the chances of marine mammals encountering lost fishing gear, resulting in possible ingestions, entanglement, injury, or death of individuals (Moore and van der Hoop 2012) if present nearshore where these structures are located. There are very few, if any, areas within the OCS geographic analysis area for marine mammals that would serve to concentrate recreational fishing and increase the likelihood that marine mammals would encounter lost fishing gear.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.
Presence of structures: Habitat conversion and prey aggregation	There are more than 130 artificial reefs in the Mid-Atlantic region. Hard bottom (scour control and rock mattresses) and vertical structures (bridge foundations and Block Island Wind Farm WTGs) in a soft-bottom habitat can create artificial reefs, thus inducing the "reef effect" (Taormina et al. 2018; NMFS 2015). The reef effect is usually considered a beneficial impact associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for seals and small odontocetes compared to the surrounding soft bottoms.	The presence of structures associated with non-offshore wind development in nearshore coastal waters has the potential to provide habitat for seals and small odontocetes as well as preferred prey species. This "reef effect" has the potential to result in long-term, low-intensity benefits. Bridge foundations would continue to provide foraging opportunities for seals and small odontocetes with measurable benefits to some individuals. Hard bottom (scour control and rock mattresses used to bury the offshore export cables) and vertical structures (i.e., WTG and OSS foundations) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (Taormina et al. 2018; Causon and Gill 2018). The reef effect is usually considered a beneficial impact associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for marine mammals compared to the surrounding soft bottoms.
Presence of structures:	No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably	Not contemplated for non-offshore wind facility sources.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Avoidance/ displacement	contributing to this sub-IPF. There may be some impacts resulting from the existing Block Island Wind Farm, but given that there are only five WTGs, no measurable impacts are occurring.	
Presence of structures: Behavioral disruption — breeding and migration	No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.
Presence of structures: Displacement into higher risk areas (vessels and fishing)	No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.
Traffic: Vessel collisions	Current activities that are contributing to this sub-IPF include port traffic levels, fairways, TSS, commercial vessel traffic, recreational and fishing activity, and scientific and academic vessel traffic. Vessel strike is relatively common with cetaceans (Kraus et al. 2005) and one of the primary causes of death to NARWs, with as many as 75% of known anthropogenic mortalities of NARWs likely resulting from collisions with large ships along the U.S. and Canadian eastern seaboard (Kite-Powell et al. 2007). Marine mammals are more vulnerable to vessel strike when they are within the draft of the vessel and when they are beneath the surface and not detectable by visual observers. Some conditions that make marine mammals less detectable include weather conditions with poor visibility (e.g., fog, rain, wave height) or nighttime operations. Vessels operating at speeds exceeding 10 knots have been associated with the highest risk for vessel strikes of NARWs (Vanderlaan and Taggart 2007). Reported vessel collisions with whales show that serious injury rarely occurs at speeds below 10 knots (Laist et al. 2001). Data show that the probability of a vessel strike increases with the velocity of a vessel	Vessel traffic associated with non-offshore wind development has the potential to result in an increased collision risk. While these impacts would be of high consequence, the patchy distribution of marine mammals makes stock or population-level effects unlikely (Navy 2018).

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	(Pace and Silber 2005; Vanderlaan and Taggart 2007).	
Climate change: Warming and sea level rise, storm severity/frequency	Increased storm frequency could result in increased energetic costs for marine mammals and reduced fitness, particularly for juveniles, calves and pups.	No future activities were identified within the geographic analysis area for marine mammals other than ongoing activities.
Climate change: Warming and sea level rise, altered habitat/ecology	This sub-IPF has the potential to lead to long-term, high- consequence impacts on marine mammals as a result of changes in distribution, reduced breeding, and/or foraging habitat availability, and disruptions in migration.	No future activities were identified within the geographic analysis area for marine mammals other than ongoing activities.
Climate change: Warming and sea level rise, altered migration patterns	This sub-IPF has the potential to lead to long-term, high- consequence impacts on marine mammal habitat use and migratory patterns. For example, the NARW appears to be migrating differently and feeding in different areas in response to changes in prey densities related to climate change (Record et al. 2019; MacLeod 2009; Nunny and Simmonds 2019).	No future activities were identified within the geographic analysis area for marine mammals other than ongoing activities.
Climate change: Warming and sea level rise, increased disease frequency	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the frequencies of various diseases of marine mammals, such as Phocine distemper. Climate change is clearly influencing infectious disease dynamics in the marine environment; however, no studies have shown a definitive causal relationship between any components of climate change and increases in infectious disease among marine mammals. This is due in large part to a lack of sufficient data and to the likely indirect nature of climate change's impact on these diseases. Climate change could potentially affect the incidence or prevalence of infection, the frequency or magnitude of epizootics, and/or the severity or presence of clinical disease in infected individuals. There are a number of potential proposed mechanisms by which this might occur (see summary in Burge et al. 2014 Climate Change Influences on Marine Infectious Diseases: Implications for Management and Society).	No future activities were identified within the geographic analysis area for marine mammals other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Climate change: Warming and sea level rise, storm severity/frequency, sediment erosion, deposition	Increased storm frequency could result in increased energetic costs for marine mammals, reduced fitness, particularly for juveniles, calves and pups. Erosion could impact seal haul outs reducing their habitat availability, especially as things like sea walls are added, blocking seals access to shore.	No future activities were identified within the geographic analysis area for marine mammals other than ongoing activities.
Climate change: Ocean acidification	This sub-IPF has the potential to lead to long-term, high- consequence impacts on marine ecosystems by contributing to reduced growth or the decline of invertebrates that have calcareous shells.	No future activities were identified within the geographic analysis area for marine mammals other than ongoing activities.
Gear utilization	Gear employed for scientific research and monitoring surveys can disturb habitats and potentially harm individuals, creating small, localized, short-term impacts	Future scientific research and monitoring activities are expected to continue and would not result in population-level impacts.

µT = microtesla; AC = alternating current; hazmat = hazardous materials

Table E1-13 Summary of Activities and the Associated Impact-Producing Factors for Navigation and Vessel Traffic

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring	Larger commercial vessels (specifically tankers) sometimes anchor outside of major ports to transfer their cargo to smaller vessels for transport into port, an operation known as lightering. These anchors have deeper ground penetration and are under higher stresses. Smaller vessels (commercial fishing or recreational vessels) would anchor for fishing and other recreational activities. These activities cause short-term impacts on navigation in the immediate anchorage area. All vessels may anchor in an emergency scenario (such as power loss) if they lose power to prevent them from drifting and creating navigational hazards for other vessels or drifting into structures.	Lightering and anchoring operations are expected to continue at or near current levels, with the expectation of moderate increases commensurate with any increase in tankers visiting ports. Deep-draft visits to major ports are expected to increase as well, increasing the potential for an emergency need to anchor and creating navigational hazards for other vessels. Recreational and commercial fishing activity would likely stay largely the same related to this IPF.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing continual upgrades and maintenance. Impacts from these activities would be short	Ports would need to perform maintenance and perform upgrades to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	term and could include congestion in ports, delays, and changes in port usage by some fishing or recreational vessel operators.	continue to increase in size. Impacts would be short term and could include congestion in ports, delays, and changes in port usage by some fishing or recreational vessel operators.
Presence of structures: Allisions	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. There are two types of allisions that occur: drift and powered. A drift allision generally occurs when a vessel is powered down due to operator choice or power failure. A powered allision generally occurs when an operator fails to adequately control their vessel movements or is distracted.	Although there are some exceptions (ferry traffic and cruise ships), BOEM expects vessel traffic to remain relatively steady into the reasonably foreseeable future (BOEM 2019:57). Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.
Presence of structures: Fish aggregation	Items in the water, such as ghost fishing gear, buoys, and energy platform foundations, can create an artificial reef effect, aggregating fish. Recreational and commercial fishing can occur near the artificial reefs. Recreational fishing is more popular than commercial near artificial reefs, as commercial mobile fishing gear can risk snagging on the artificial reef structure.	Fishing near artificial reefs is not expected to change meaningfully over the next 34 years.
Presence of structures: Habitat conversion	Equipment in the ocean can create a substrate for mollusks to attach to and fish eggs to settle near. This can create a reef-like habitat and benefit structure-oriented species on a constant basis.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Migration disturbances	Noise-producing activities, such as pile driving and vessel traffic, may interfere with and adversely affect marine mammals during foraging, orientation, migration, response to predators, social interactions, or other activities. Marine mammals may also be sensitive to changes in magnetic field levels. The presence of structures and operational noise could cause mammals to avoid areas.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions. When multiple vessels need to navigate around a structure, then navigation is made more complex, as the vessels need to avoid both the structure and each other.	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 35 years. Even with increased port visits by deep-draft vessels, this is still a relatively small adjustment when considering the whole of New England vessel traffic. The

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
		presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space-use conflicts	Currently, the offshore area is occupied by marine trade, stationary and mobile fishing, and survey activities.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Cable infrastructure	See IPF for anchoring.	See IPF for anchoring.
New cable emplacement/ maintenance	Within the geographic analysis area for navigation and vessel traffic, existing cables may require access for maintenance activities. Infrequent cable maintenance activities may cause short-term increases in vessel traffic and navigational complexity.	Future new cables would cause short-term increases in vessel traffic during installation or maintenance, resulting in infrequent, localized, short-term impacts over the next 34 years. Care would need to be taken by vessels that are crossing the cable routes during these activities.
Traffic: Aircraft	USCG SAR helicopters are the main aircraft that may be flying at low enough heights to risk interaction with WTGs. USCG SAR aircraft need to fly low enough that they can spot objects in the water.	SAR operations could be expected to increase with any increase in vessel traffic. However, as vessel traffic volume is not expected to increase appreciably, neither should SAR operations. Draft EIS Section 3.6.6 provides a discussion of navigation impacts on fishing vessel traffic.
Traffic: Vessels	See the sub-IPF for presence of structures: navigation hazard.	See the sub-IPF for presence of structures: navigation hazard.
Traffic: Vessels, collisions	See the sub-IPF for presence of structures: navigation hazard.	See the sub-IPF for presence of structures: navigation hazard.

Table E1-14 Summary of Activities and the Associated Impact-Producing Factors for Other Uses: National Security and Military Use

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Allisions	Existing stationary facilities that present allision risks include buoys used to mark inlet approaches, channels, shoals (NOAA 2021), dock facilities, meteorological buoys associated with offshore wind lease areas, and other offshore or shoreline-based structures.	No additional non-offshore wind stationary structures were identified within the geographic analysis area. Stationary structures such as private or commercial docks may be added close to the shoreline.
Presence of structures: Fish aggregation	No existing stationary structures that would act as FADs were identified within the geographic analysis area.	No future non-offshore wind additional stationary structures that would act as FADs were identified within the geographic analysis area.
Presence of structures: Navigation hazard	Existing stationary facilities within the geographic analysis area that present navigational hazards include buoys used to mark inlet approaches, channels, shoals (NOAA 2021), dock facilities, meteorological buoys associated with offshore wind lease areas, and other offshore or shoreline-based structures.	No future non-offshore wind stationary structures were identified within the offshore geographic analysis area. Onshore development activities are anticipated to continue with additional proposed communication towers and onshore commercial, industrial, and residential developments.
Presence of structures: Space-use conflicts	Existing stationary facilities within the geographic analysis area that could present a space-use conflict include onshore wind turbines, communication towers, and other onshore commercial, industrial, and residential structures.	No future non-offshore wind stationary structures were identified within the offshore geographic analysis area. Onshore development activities are anticipated to continue with additional proposed communication towers and onshore commercial, industrial, and residential developments.
Presence of structures: Cable infrastructure	Existing submarine cables cross cumulative lease areas.	Submarine cables would remain in current locations with infrequent maintenance continuing along those cable routes for the foreseeable future.
Traffic: Vessels	Current vessel traffic in the region is described in Draft EIS Section 3.6.6. Vessel activities associated with offshore wind in the cumulative lease areas are currently limited to site assessment surveys.	Continued vessel traffic in the region, as described in Draft EIS Section 3.6.6.
Traffic: Vessels, collisions	Current vessel traffic in the region is described in Draft EIS Section 3.6.6. Vessel activities associated with offshore wind in the cumulative lease areas are currently limited to site assessment surveys.	Continued vessel traffic in the region is described in Draft EIS Section 3.6.6.

FAD = fish aggregating device

Table E1-15 Summary of Activities and the Associated Impact-Producing Factors for Other Uses: Aviation and Air Traffic

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Towers	Existing aboveground stationary facilities within the geographic analysis area that present aviation hazards include onshore wind turbines, communication towers, dock facilities, and other onshore structures exceeding 200 feet in height.	No future non-offshore wind stationary structures were identified within the offshore geographic analysis area. Onshore development activities are anticipated to continue with additional proposed communication towers.
Presence of structures: Space-use conflicts	Existing aboveground stationary facilities within the geographic analysis area that could cause space-use conflicts for aircraft include onshore wind turbines, communication towers, and other onshore structures exceeding 200 feet in height.	No future non-offshore wind stationary structures were identified within the offshore geographic analysis area. Onshore development activities are anticipated to continue with additional proposed communication towers.

Table E1-16 Summary of Activities and the Associated Impact-Producing Factors for Other Uses: Cables and Pipelines

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Allisions and navigation hazards	Structures within and near the geographic analysis area that pose potential allision hazards include buoys used to mark inlet approaches, channels, shoals, meteorological buoys associated with offshore wind lease areas, and shoreline developments such as docks, ports, and other commercial, industrial, and residential structures.	Reasonably foreseeable non-offshore wind structures that could affect submarine cables have not been identified in the geographic analysis area.
Presence of structures: Space-use conflicts	Existing submarine cables cross cumulative lease areas and create potential space-use conflicts with marine mineral and sand borrow areas.	Reasonably foreseeable non-offshore wind structures that could create space-use conflicts with submarine cables have not been identified in the geographic analysis area.
Presence of structures: Cable infrastructure	Existing submarine cables cross cumulative lease areas.	Reasonably foreseeable non-offshore wind structures have not been identified in the geographic analysis area.

Table E1-17 Summary of Activities and the Associated Impact-Producing Factors for Other Uses: Marine Minerals

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Space-use conflicts	Existing structures within the cumulative lease areas create potential space-use conflicts with marine mineral and sand borrow areas.	Reasonably foreseeable non-offshore wind structures could have a small, long-term effect on marine mineral extraction.
Presence of structures: Cable infrastructure	Marine mineral extraction typically occurs within 8 miles of the shoreline, limiting adverse impacts on the offshore export cable routes.	Future cable installation would require consultation with the BOEM Marine Minerals Program.

Table E1-18 Summary of Activities and the Associated Impact-Producing Factors for Other Uses: Radar Systems

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Towers	Wind developments in the direct line of sight with, or extremely close to, radar systems can cause clutter and interference.	Reasonably foreseeable non-offshore wind structures proposed for construction in the offshore wind lease areas that could affect radar systems have not been identified.

Table E1-19 Summary of Activities and the Associated Impact-Producing Factors for Other Uses: Scientific Research and Surveys

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Navigation hazards	Stationary structures are limited in the open ocean environment of the geographic analysis area and include meteorological buoys associated with site assessment activities, the five Block Island Wind Farm WTGs, and the two Coastal Virginia Offshore Wind WTGs.	Reasonably foreseeable non-offshore wind activities would not implement stationary structures within the open ocean environment that would pose navigational hazards and raise the risk of allisions for survey vessels and collisions for survey aircraft.

Table E1-20 Summary of Activities and the Associated Impact-Producing Factors for Recreation and Tourism

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring	Anchoring occurs due to ongoing military, survey, commercial, and recreational activities.	Impacts from anchoring would continue and may increase due to offshore military operations, survey activities, commercial vessel traffic, and recreational vessel traffic. Modest growth in vessel traffic could increase the short-term, localized impacts of navigational hazards, increased turbidity levels, and potential for direct contact causing mortality of benthic resources.
Light: Vessels	Ocean vessels have an array of lights including navigational lights and deck lights.	Anticipated modest growth in vessel traffic would result in some growth in the nighttime traffic of vessels with lighting.
Light: Structures	Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and cause short-term increases in suspended sediment; these disturbances would be localized and limited to emplacement corridors.	Cable maintenance or replacement of existing cables in the geographic analysis area would occur infrequently and would generate short-term disturbances.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are short-term and localized, and extend only a short distance beyond the work area.	No future activities were identified within the recreation and tourism geographic analysis area other than ongoing activities.
Noise: Cable laying/ trenching	Offshore trenching occurs periodically in connection with cable installation or sand and gravel mining.	No future activities were identified within the recreation and tourism geographic analysis area other than ongoing activities.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size	Ports would need to perform maintenance and upgrade facilities over the next 34 years to ensure that they can still receive the projected future volume of vessels visiting

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	also increases. Ports are also undergoing continual upgrades and maintenance.	their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Port utilization: Maintenance/ dredging	Periodic maintenance is necessary for harbors within the geographic analysis area.	Ongoing maintenance and dredging of harbors within the geographic analysis area would continue as needed. No specific projects are known.
Presence of structures: Allisions	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. The likelihood of allisions is expected to continue at or near current levels.	Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures.	No future activities were identified within the recreation and tourism geographic analysis area other than ongoing activities.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables, create uncommon relief in a mostly flat seascape. Structure-oriented fishes are attracted to these locations. Recreational and commercial fishing can occur near these aggregation locations, although recreational fishing is more popular because commercial mobile fishing gear is more likely to snag on structures.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Habitat conversion	Structures, including foundations, scour protection around foundations, and various means of hard protection atop cables, create uncommon relief in a mostly flat seascape. Structure-oriented species thus benefit on a constant basis.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, because vessels need to avoid both the structure and each other.	Vessel traffic, overall, is not expected to meaningfully increase over the next 34 years. The presence of navigational hazards is expected to continue at or near current levels.
Presence of structures: Space-use conflicts	Current structures do not result in space-use conflicts.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Viewshed	The only existing offshore structures within the viewshed of the Project are minor features such as buoys.	Non-offshore wind structures that could be viewed in conjunction with the offshore components of the Project would be limited to meteorological towers. Marine activity would also occur within the marine viewshed.
Traffic: Vessels	Geographic analysis area ports and marine traffic related to shipping, fishing, and recreation are important to the region's economy. No substantial changes are anticipated to existing vessel traffic volumes.	New vessel traffic near the geographic analysis area would be generated by proposed barge routes and dredging demolition sites over the next 34 years. Marine commerce and related industries would continue to be important to the geographic analysis area economy.
Traffic: Vessel collisions	The region's substantial marine traffic may result in occasional vessel collisions, which would result in costs to the vessels involved. The likelihood of collisions is expected to continue at or near current rates.	An increased risk of collisions is not anticipated from future activities.

Table E1-21 Summary of Activities and the Associated Impact-Producing Factors for Sea Turtles

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	Ongoing releases are frequent and chronic. Sea turtle exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality (Shigenaka et al. 2010) or sublethal effects on individual fitness, including adrenal effects, dehydration, hematological effects, increased disease incidence, liver effects, poor body condition, skin effects, skeletomuscular effects, and several other health effects that can be attributed to oil exposure (Camacho et al. 2013; Bembenek-Bailey et al. 2019; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Additionally, accidental releases may result in impacts on sea turtles due to effects on prey species.	Gradually increasing vessel traffic over the next 34 years would increase the risk of accidental releases. Sea turtle exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality (Shigenaka et al. 2010; Wallace et al. 2010) or sublethal effects on individual fitness, including adrenal effects, dehydration, hematological effects, increased disease incidence, liver effects, poor body condition, skin effects, skeletomuscular effects, and several other health effects that can be attributed to oil exposure (Camacho et al. 2013; Bembenek-Bailey et al. 2019; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Additionally, accidental releases may result in impacts on sea turtles due to effects on prey species.
Accidental releases: Trash and debris	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities, cables, lines, and	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	pipeline laying, as well as debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low-quantity, localized, and low-impact events. Direct ingestion of plastic fragments is well documented and has been observed in all species of sea turtles (Bugoni et al. 2001; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). In addition to plastic debris, ingestion of tar, paper, Styrofoam™, wood, reed, feathers, hooks, lines, and net fragments has also been documented (Thomás et al. 2002). Ingestion can also occur when individuals mistake debris for potential prey items (Gregory 2009; Hoarau et al. 2014; Thomás et al. 2002). Potential ingestion of marine debris varies among species and life history stages due to differing feeding strategies (Nelms et al. 2016). Ingestion of plastics and other marine debris can result in both lethal and sublethal impacts on sea turtles, with sublethal effects more difficult to detect (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). Long-term sublethal effects may include dietary dilution, chemical contamination, depressed immune system function, poor body condition, and reduced growth rates, fecundity, and reproductive success. However, these effects are cryptic and clear causal links are difficult to identify (Nelms et al. 2016).	and pipeline laying, and debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low-quantity, localized, and low-impact events. Direct and indirect ingestion of plastic fragments and other marine debris is well documented and has been observed in all species of sea turtles (Bugoni et al. 2001; Gregory 2009; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014; Thomás et al. 2002). Ingestion can result in both lethal and sublethal impacts on sea turtles, with sublethal effects more difficult to detect (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). However, these effects are cryptic and clear causal links are difficult to identify (Nelms et al. 2016).
EMF	EMFs emanate constantly from installed telecommunication and electrical power transmission cables. Sea turtles appear to have a detection threshold of magnetosensitivity and behavioral responses to field intensities ranging from 0.0047 to 4000 μT for loggerhead turtles, and 29.3 to 200 μT for green turtles, with other species likely similar due to anatomical, behavioral, and life history similarities (Normandeau et al. 2011). Juvenile or adult sea turtles foraging on benthic organisms may be able to detect magnetic fields while they are foraging on the bottom near the cables and up to potentially 82 feet (25 meters) in the water column above the cable. Juvenile and adult sea turtles may detect the EMF over	During operations, future new cables would produce EMF. Submarine power cables in the geographic analysis area for sea turtles are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels (BOEM 2007:). EMF of any two sources would not overlap. Although the EMF would exist as long as a cable was in operation, impacts, if any, would likely be difficult to detect, if they occur at all. Furthermore, this IPF would be limited to extremely small portions of the areas used by resident or migrating sea turtles. As such, exposure to this IPF would be low and impacts on sea turtles would not be expected.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	relatively small areas near cables (e.g., when resting on the bottom or foraging on benthic organisms near cables or concrete mattresses). There are no data on impacts on sea turtles from EMFs generated by underwater cables, although anthropogenic magnetic fields can influence migratory deviations (Luschi et al. 2007; Snoek et al. 2016). However, any potential impacts from AC cables on turtle navigation or orientation would likely be undetectable under natural conditions, and thus would be insignificant (Normandeau et al. 2011).	
Light: Vessels	Ocean vessels such as ongoing commercial vessel traffic, recreational and fishing activity, and scientific and academic research traffic have an array of lights including navigational, deck lights, and interior lights. Such lights have some limited potential to attract sea turtles although the impacts, if any, are expected to be localized and short-term.	Construction, operations, and decommissioning vessels associated with non-offshore wind activities produce short-term and localized light sources that could result in attraction or avoidance behavior of sea turtles. These short-term impacts are expected to be of low intensity and occur infrequently.
Light: Structures	Artificial lighting on nesting beaches or in nearshore habitats has the potential to result in disorientation to nesting females and hatchling turtles. Artificial lighting on the OCS does not appear to have the same potential for effects. Decades of oil and gas platform operation in the Gulf of Mexico, which can have considerably more lighting than offshore WTGs, has not resulted in any known impacts on sea turtles (BOEM 2019).	Non-offshore wind activities would not be expected to appreciably contribute to this sub-IPF. As such, no impact on sea turtles would be expected.
New cable emplacement/ maintenance	Cable maintenance activities disturb bottom sediments and cause short-term increases in suspended sediment; these disturbances would be localized and generally limited to the emplacement corridor. Data are not available regarding effects of suspended sediments on adult and juvenile sea turtles, although elevated suspended sediments may cause individuals to alter normal movements and behaviors. However, these changes are expected to be too small to be detected (NOAA 2020). Sea turtles would be expected to swim away from the sediment plume. Elevated turbidity is most likely to affect sea turtles if a plume causes a barrier to normal behaviors, but no impacts would be expected due to swimming through the plume (NOAA 2020). Turbidity associated with increased	The impact on water quality from accidental sediment suspension during cable emplacement is short term. If elevated turbidity caused any behavioral responses such as avoidance of the turbidity zone or changes in foraging behavior, such behaviors would be short-term and any impacts would be short term. Turbidity associated with increased sedimentation may result in short-term impacts on some sea turtle prey species.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	sedimentation may result in short-term impacts on sea turtle prey species.	
Noise: Aircraft	Aircraft routinely travel in the geographic analysis area for sea turtles. With the possible exception of rescue operations, no ongoing aircraft flights would occur at altitudes that would elicit a response from sea turtles. If flights are at a sufficiently low altitude, sea turtles may respond with a startle response (diving or swimming away), altered submergence patterns, and a short-term stress response (NSF and USGS 2011; Samuel et al. 2005). These brief responses would be expected to dissipate once the aircraft has left the area.	Future low-altitude aircraft activities such as survey activities and navy training operations could result in short-term responses of sea turtles to aircraft noise. If flights are at a sufficiently low altitude, sea turtles may respond with a startle response (diving or swimming away), altered submergence patterns, and a short-term stress response (NSF and USGS 2011; Samuel et al. 2005). These brief responses would be expected to dissipate once the aircraft has left the area.
Noise: G&G	Infrequent site characterization surveys and scientific surveys produce high-intensity, impulsive noise around sites of investigation. These activities have the potential to result in some impacts including potential auditory injuries, short-term disturbance, behavioral responses, and short-term displacement of feeding or migrating sea turtles if present within the ensonified area (NSF and USGS 2011). The potential for PTS and TTS is considered possible in proximity to G&G surveys utilizing air guns, but impacts are unlikely, as turtles would be expected to avoid such exposure and survey vessels would pass quickly (NSF and USGS 2011). No significant impacts would be expected at the population level.	Same as ongoing activities, with the addition of possible future oil and gas exploration surveys.
Noise: Turbines	Available evidence suggests that typical underwater noise levels from operating WTGs would be below current cumulative injury and behavioral effect thresholds for sea turtles. Operating turbines were determined to produce underwater noise on the order of 110 to 125 $dB_{RMS,}$ occasionally reaching as high as 128 dB_{RMS}, in the 10-Hz to 8-kilohertz range (Tougaard et al. 2020). As measured at the Block Island Wind Farm, low-frequency operational noise barely exceeds ambient levels at 164 feet (50 meters) from the WTG base (Miller and Potty 2017). Operational noise impacts would be expected to be negligible.	This sub-IPF does not apply to future non-offshore wind development.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water or through the seabed can result in high-intensity, low-exposure-level, and long-term but localized intermittent risk to sea turtles. Impacts, potentially including behavioral responses, masking, TTS, and PTS, would be localized in nearshore waters. Data regarding threshold levels for impacts on sea turtles from sound exposure during pile driving are very limited, and no regulatory threshold criteria have been established for sea turtles. Based on current literature, the following thresholds are used to assess impacts on turtles: Potential mortal injury: 210 dB cumulative SPL or greater than 207 dB peak SPL (Popper et al. 2014) Potential mortal injury: 204 dB_{SEL}, 232 dB_{PEAK} (PTS) 189 dB_{SEL}, 226 dB_{PEAK} (TTS) (Navy 2017) Behavioral harassment: 175 dB referenced to 1 µPa RMS (Navy 2017)	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Noise: Vessels	The frequency range for vessel noise (10 to 1000 Hz) (MMS 2007) overlaps with sea turtles' known hearing range (less than 1,000 Hz with maximum sensitivity between 200 to 700 Hz) (Bartol 1994) and would therefore be audible. However, Hazel et al. (2007) suggests that sea turtles' ability to detect approaching vessels is primarily vision-dependent, not acoustic. Sea turtles may respond to vessel approach or noise with a startle response (diving or swimming away) and a short-term stress response (NSF and USGS 2011). Samuel et al. (2005) indicated that vessel noise could have an effect on sea turtle behavior, especially their submergence patterns.	Any offshore projects that require the use of ocean vessels could potentially result in long-term but infrequent impacts on sea turtles, including short-term startle responses, masking of biologically relevant sounds, physiological stress, and behavioral changes, especially their submergence patterns (NSF and USGS 2011; Samuel et al. 2005). However, BOEM expects that these brief responses of individuals to passing vessels would be unlikely given the patchy distribution of sea turtles, and no stock or population-level effects would be expected.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also undergoing continual upgrades and maintenance. Port expansion activities are localized to nearshore habitats and are expected to result in short-term impacts, if any, on sea turtles.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity would increase

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	Vessel noise may affect sea turtles, but response would be expected to be short term (see the Vessels: Noise sub-IPF above). The impacts on water quality from sediment suspension during port expansion activities is short term, and would be similar to those described under the Cable emplacement/maintenance IPF above.	modestly. The ability of ports to receive the increase in larger ships would require port modifications. Future channel-deepening activities are being undertaken to accommodate deeper-draft vessels for the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future. Additional impacts associated with the increased risk of vessel strikes could also occur (see the Traffic: Vessel collisions sub-IPF below).
Presence of structures: Entanglement or ingestion of lost fishing gear	The Mid-Atlantic region has more than 130 artificial reefs. Currently, bridge foundations and the Block Island Wind Farm may be considered artificial reefs and may have higher levels of recreational fishing, which increases the chances of sea turtles encountering lost fishing gear, resulting in possible ingestions, entanglement, injury, or death of individuals (Berreiros and Raykov 2014; Gregory 2009; Vegter et al. 2014) if present where these structures are located. At the scale of the OCS geographic analysis area for sea turtles, there are very few areas that would serve to concentrate recreational fishing and increase the likelihood that sea turtles would encounter lost fishing gear.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Presence of structures: Habitat conversion and prey aggregation	The Mid-Atlantic region has more than 130 artificial reefs. Hard-bottom (scour control and rock mattresses) and vertical structures (bridge foundations, Block Island Wind Farm WTGs, and two WTGs with the Coastal Virginia Offshore Wind pilot project) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (Taormina et al. 2018; NMFS 2015). The reef effect is usually considered a beneficial impact associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available	The presence of structures associated with non-offshore wind development in nearshore coastal waters has the potential to provide habitat for sea turtles as well as preferred prey species. This reef effect has the potential to result in long-term, low-intensity, beneficial impacts. Bridge foundations would continue to provide foraging opportunities for sea turtles with measurable benefits to some individuals.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	forage items and shelter for sea turtles compared to the surrounding soft bottoms.	
Presence of structures: Avoidance/ displacement	No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to this sub-IPF. There may be some impacts resulting from the existing Block Island Wind Farm (five WTGs) and Coastal Virginia Offshore Wind pilot project (two WTGs) but given the limited number of WTGs, no measurable impacts are occurring.	Not contemplated for non-offshore wind facility sources.
Presence of structures: Behavioral disruption — breeding and migration	No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.
Presence of structures: Displacement into higher risk areas (vessels and fishing)	No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.
Traffic: Vessel collisions	Current activities contributing to this sub-IPF include port traffic levels, fairways, TSS, commercial vessel traffic, recreational and fishing activity, and scientific and academic vessel traffic. Propeller and collision injuries from boats and ships are common in sea turtles. Vessel strike is an increasing concern for sea turtles, especially in the southeastern United States where development along the coasts is likely to result in increased recreational boat traffic. In the United States, the percentage of strandings of loggerhead sea turtles attributed to vessel strikes increased from approximately 10% in the 1980s to a record high of 20.5% in 2004 (NMFS and USFWS 2007). Sea turtles are most susceptible to vessel collisions in coastal waters, where they forage from May through November. Vessel speed may exceed 10 knots in such waters, and evidence suggests that they cannot reliably avoid being struck by vessels exceeding 2 knots (Hazel et al. 2007).	Vessel traffic associated with non-offshore wind development has the potential to result in an increased collision risk. While these impacts would be of high consequence, the patchy distribution of sea turtles makes stock or population-level effects unlikely (Navy 2018).

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Climate change: Warming and sea level rise, storm severity/frequency	Increased storm frequency could lead to long-term, high- consequence impacts on sea turtle onshore beach nesting habitat, including changes to nesting periods, changes in sex ratios of nestlings, drowned nests, as well as loss or degradation of nesting beaches. Offshore impacts, including sedimentation of near-shore hard bottom habitats have the potential to result in long-term, high consequence changes to foraging habitat availability for green turtles.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Climate change: Ocean acidification	This sub-IPF has the potential to lead to long-term, high- consequence impacts on marine ecosystems by contributing to reduced growth or the decline of invertebrates that have calcareous shells.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Climate change: Warming and sea level rise, altered habitat/ecology	This sub-IPF has the potential to lead to long-term, high- consequence impacts on sea turtles by influencing distributions of sea turtles and/or prey resources. This sub-IPF has the potential to lead to long-term, high-consequence impacts on sea turtle breeding, foraging, and sheltering habitat use.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Climate change: Warming and sea level rise, altered migration patterns	This sub-IPF has the potential to lead to long-term, high- consequence impacts on sea turtle habitat use and migratory patterns.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Climate change: Warming and sea level rise, disease frequency	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the frequencies of various diseases of sea turtles such as fibropapillomatosis.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Climate change: Warming and sea level rise, protective measures (barriers, sea walls)	The proliferation of coastline protections has the potential to result in long-term, high-consequence impacts on sea turtle nesting by eliminating or precluding access to potentially suitable nesting habitat or access to potentially suitable habitat.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Climate change: Warming and sea level rise, storm severity, frequency,	Sediment erosion and/or deposition in coastal waters have the potential to result in long-term, high-consequence impacts on green sea turtle foraging habitat. Additionally, sediment erosion has the	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
sediment erosion, deposition	potential to result in the degradation or loss of potentially suitable nesting habitat.	
Gear utilization	Gear employed for scientific research and monitoring surveys can disturb habitats and potentially harm individuals, creating small, localized, short-term impacts.	Future scientific research and monitoring activities are expected to continue and would not result in population-level impacts.

μT = microtesla; AC = alternating current; hazmat = hazardous materials

Table E1-22 Summary of Activities and the Associated Impact-Producing Factors for Scenic and Visual Resources

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat, suspended sediments, trash and debris	Ongoing offshore and onshore construction projects involve the use of vehicles, vessels, and equipment that contain fuel, fluids, and hazmat that have the potential for accidental release. Offshore and onshore construction can also result in sedimentation from land and seabed disturbance and accidental releases of trash and debris with associated visual impacts.	Future offshore and onshore construction projects have the potential to result in accidental releases from vehicles, vessels, and equipment that contain fuel, fluids, and hazmat. Future offshore and onshore construction could also result in sedimentation from land and seabed disturbance and accidental releases of trash and debris with associated visual impacts.
Land disturbance: Erosion and sedimentation, onshore construction, onshore land use changes	Onshore human-caused and naturally occurring erosion and sedimentation results from construction, maintenance, and weather events.	Ongoing onshore construction projects could generate noticeable disturbance in the landscape. Intensity and extent would vary depending on the location, type, and duration of activities.
Light: Offshore structures and vessels, onshore vehicles, roads, laydown, parking, facilities, equipment, and structures	Offshore vessels have an array of lights including navigational lights, deck lights, and interior lights. Various ongoing onshore and coastal construction projects have nighttime activities, as well as existing structures, facilities, and vehicles that would require nighttime lighting.	Ongoing onshore construction projects involving nighttime activity could generate nighttime lighting. Intensity and extent would vary depending on the location, type, direction, and duration of nighttime lighting.
Structures: Viewshed	Buoys are the only existing stationary structures within the offshore viewshed of the Project. Typically, buoys are visible only in the immediate foreground (less than 1 mile). Stationary and moving barges, boats, and ships also are visible in the daytime and nighttime viewsheds.	Onshore wind-related structures that could be viewed in conjunction with the offshore project components would be limited to meteorological towers, substations, and electrical transmission towers and conductors.
Traffic: Helicopters, vessels, vehicles	Ongoing activities contribute air, marine, and onshore traffic and visible congestion.	Planned onshore and offshore construction projects involving vessel, vehicle, and helicopter traffic could generate noticeable changes in the characteristic seascape and landscape and viewer experience. Intensity and extent of the changes would vary depending on the location, type, direction, and duration of the traffic.

hazmat = hazardous materials

Table E1-23 Summary of Activities and the Associated Impact-Producing Factors for Water Quality

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	Accidental releases of fuels and fluids occur during vessel usage for dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable lines and pipeline-laying activities. According to the U.S. Department of Energy, 31,000 barrels of petroleum are spilled into U.S. waters from vessels and pipelines in a typical year. Approximately 40.5 million barrels of oil were lost as a result of tanker incidents from 1970 to 2009, according to International Tanker Owners Pollution Federation Limited, which collects data on oil spills from tankers and other sources. From 1990 to 1999, the average annual input to the coastal Northeast was 220,000 barrels of petroleum and into the offshore was fewer than 70,000 barrels. Impacts on water quality would be expected to brief and localized from accidental releases.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend. Impacts are unlikely to affect water quality.
Accidental releases: Trash and debris	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities, and cables, lines, and pipeline laying. Accidental releases of trash and debris are expected to be low-probability events. BOEM assumes operator compliance with federal and international requirements for management of shipboard trash; such events also have a relatively limited spatial impact.	As population and vessel traffic increase gradually over the next 34 years, accidental release of trash and debris may increase. However, there does not appear to be evidence that the volumes and extents anticipated would have any effect on water quality.
Anchoring	Impacts from anchoring occur due to ongoing military use and survey, commercial, and recreational activities.	Impacts from anchoring may occur semi-regularly over the next 34 years due to offshore military operations or survey activities. These impacts would include increased seabed disturbance, resulting in increased turbidity levels. All impacts would be localized, short term.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
New cable emplacement/ maintenance	Elevated suspended sediment concentrations can occur under natural tidal conditions and increase during storms, trawling, and vessel propulsion. Survey activities and new cable- and pipeline-laying activities disturb bottom sediments and cause short-term increases in suspended sediment; these disturbances would be short term and either limited to the emplacement corridor or localized.	Suspension of sediments may continue to occur infrequently over the next 34 years due to survey activities and submarine cable, lines, and pipeline-laying activities. Future new cables would occasionally disturb the seafloor and cause short-term increases in turbidity and minor alterations in localized currents, resulting in localized, short-term impacts. If the cable routes enter the water quality geographic analysis area, short-term disturbance in the form of increased suspended sediment and turbidity would be expected.
Port utilization: Expansion	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity would increase modestly. The ability of ports to receive the increase in larger ships would require port modifications, which, along with additional vessel traffic, could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future.	The general trend along the coastal region from Virginia to Maine is that port activity would increase modestly over the next 34 years. Port modifications and channel-deepening activities are being undertaken to accommodate the increase in vessel traffic and deeper-draft vessels that transit the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future.
Presence of structures	The installation of onshore and offshore structures leads to alteration of local water currents. These disturbances would be localized but, depending on the hydrologic conditions, have the potential to affect water quality through the formation of sediment plumes.	Impacts associated with the presence of structures includes short-term sediment disturbance during maintenance. This sediment suspension would lead to interim and localized impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Discharges	Discharges affect water quality by introducing nutrients, chemicals, and sediments to the water. There are regulatory requirements related to prevention and control of discharges, accidental spills, and nonindigenous species.	Increased coastal development is causing increased nutrient pollution in communities. In addition, ocean disposal activity in the North and Mid-Atlantic is expected to gradually decrease or remain stable. Impacts of ocean disposal on water quality are minimized because USEPA has established dredge spoil criteria and regulates the disposal permits issued by USACE. The impact on water quality from sediment suspension during these future activities would be short term and localized.
Land disturbance: Erosion and sedimentation	Ground-disturbing activities may lead to unvegetated or otherwise unstable soils. Precipitation events could potentially mobilize the soils into nearby surface waters, leading to potential erosion and sedimentation effects and subsequent increased turbidity.	Ground disturbance associated with construction and installation of onshore components could lead to unvegetated or unstable soils. Precipitation events could mobilize these soils, leading to erosion and sedimentation effects and turbidity. The impacts for future offshore wind through this IPF would be staggered in time and localized. The impacts would be short term and localized with an increased likelihood of impacts limited to onshore construction periods.
Land disturbance: Onshore construction	Onshore construction activities may lead to unvegetated or otherwise unstable soils as well as soil contamination due to leaks or spills from construction equipment. Precipitation events could potentially mobilize the soils into nearby surface waters, leading to increased turbidity and alteration of water quality.	The general trend along coastal regions is that port activity would increase modestly in the future. This increase in activity includes expansion needed to meet commercial, industrial, and recreational demand. Modifications to cargo-handling equipment and conversion of some undeveloped land to meet port demand would be required to receive the increase in larger ships.

hazmat = hazardous materials

Table E1-24 Summary of Activities and the Associated Impact-Producing Factors for Wetlands

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Land disturbance: Erosion and sedimentation	Ground disturbance activities may lead to unvegetated or otherwise unstable soils. Precipitation events could potentially mobilize the soils into nearby wetlands, leading to potential erosion and sedimentation effects and subsequent increased turbidity.	Ground disturbance associated with construction and installation of onshore components could lead to unvegetated or unstable soils. Precipitation events could mobilize these soils, leading to erosion and sedimentation effects and turbidity. Impacts from future offshore wind activities through this IPF would be staggered in time and localized. The impacts would be short term and localized, with an increased likelihood of impacts limited to onshore construction periods.
Land disturbance: Onshore construction	Onshore construction activities may lead to unvegetated or otherwise unstable soils as well as soil contamination due to leaks or spills from construction equipment. Precipitation events could potentially mobilize the soils into nearby wetlands, leading to increased turbidity and alteration of water quality.	The general trend along coastal regions is that port activity and land development would increase modestly in the future. This increase in activity includes expansion needed to meet commercial, industrial, and recreational demand. Modifications to cargo-handling equipment and conversion of some undeveloped land to meet port demand would be required to receive the increase in larger ships.

Attachment E2: Maximum-Case Scenario Estimates for Offshore Wind Projects

The following tables provide maximum-case scenario estimates of potential offshore wind project impacts assuming maximum buildout within the Sunrise Wind Draft EIS geographic analysis areas. BOEM developed these estimates based on offshore wind demand, as discussed in its 2019 study *National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf* (BOEM 2019). Estimates disclosed in this Draft EIS's Chapter 3, No Action analyses were developed by summing acreage or number calculations across all lease areas noted as occurring within, or overlapping, a given geographic analysis area. This likely overestimates some impacts in cases where lease areas only partially overlap analysis areas. However, this approach was used to provide the most conservative estimate of future offshore wind development.

Table E2-1 Offshore Wind Development Activities on the U.S. East Coast: Projects and Assumptions (Part 1, Turbine and Cable Design Parameters)

Region	Lease, Project, Lease Remainder[1]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[3]						Estimated Construction Schedule[4]	Turbine Number[5]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles)[6]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Interarray Cable Length (statute miles)[7]	Hub Height (feet)[8]	Rotor Diameter (feet)[8]	Height of Turbine (feet)[8]
			Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism									
ME	*Aqua ventus (state waters)*	State Project					X		2023	2	11					450	520
	Total Other State Waters Projects									**2**	**11**					**450**	**520**
Existing and Ongoing Projects																	
MA/RI	*Block Island (state waters)*	Built					X	X	Built	5	30	28	5	2	328	541	659
MA/RI	*Vineyard Wind 1 part of OCS-A 0501*	COP Approved (ROD issued 2021), PPA, SAP					X	X	2023	62	800	98	6.5	171	451	721	812
MA/RI	*South Fork, OCS-A 0517*	COP Approved (ROD issued 2021), PPA, SAP	X		X		X	X	2023	12	130	139	6.5	24	472	735	840
VA/NC	*CVOW, OCS-A 0497*	RAP, FDR/FIR					X		Built	2	12	27	3	9	364	506	620
	Total Existing and Ongoing Projects									**81**	**972**	**292**		**206**			
Planned Projects																	
Massachusetts/Rhode Island Region																	
MA/RI	Sunrise, OCS-A 0487	COP, PPA, SAP	X	X	X	X	X	X	2024	94	1,034	105	6.5	180	459	656	787
MA/RI	Revolution, part of OCS-A 0486	COP, PPA, SAP	X		X		X	X	2023–2024	100	880	100	131	155	512	722	873
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	COP, PPA, SAP					X	X	2024–2026	62	804	125	10	139	630	837	1,047
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	COP, PPA, SAP					X	X	2024–2026	79	1,500	225	10	201	702	935	1,171
MA/RI	Mayflower OCS-A 0521	COP, PPA, SAP					X	X	2024–2028	147	2,400	1,179	6.5	497	605	919	1,066
MA/RI	Beacon Wind 1, part of OCS-A 0520	PPA, SAP						X	2024–2025	78	1,230	233	6.5	186	591	984	853
MA/RI	Beacon Wind 2, part of OCS-A 0520	SAP					X	X	2025–2026	77	1,200	233	6.5	186	591	984	853
MA/RI	Bay State Wind, part of OCS-A 0500	SAP, COP (unpublished); the MW is included in the description below in the 5,148 MW.	X		X		X	X	By 2030, spread over 2025–2030	110	4,200	120	6.5	172	492	722	853
MA/RI	Liberty Wind, part of OCS-A 0522	This group is exposed to 5,800 MW of demand—for MA (4,000 MW remaining), CT (900 MW remaining), and RI (900 MW expected). Collectively the remaining technical capacity is 5,148 MW.					X	X		227		120	6.5	398	492	722	853
MA/RI	OCS-A 0500 remainder						X	X				120			492	722	853
MA/RI	OCS-A 0487 remainder						X	X				120			492	722	853
MA/RI	Remaining MA/RI Lease Area Total[2]	73%								337	4,400	480	6.5	540	492	722	853

Region	Lease, Project, Lease Remainder[1]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[3]						Estimated Construction Schedule[4]	Turbine Number[5]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles)[6]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Interarray Cable Length (statute miles)[7]	Hub Height (feet)[8]	Rotor Diameter (feet)[8]	Height of Turbine (feet)[8]
			Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism									
	Total MA/RI Leases[2]									**974**	**13,248**	**2,680**		**2,084**			
New York/New Jersey Region																	
NY/NJ	Ocean Wind 1, OCS-A 0498	COP, PPA, SAP					X	X	2023–2025	98	1,100	194[11]	98	190	512	788	906
NY/NJ	Atlantic Shores South (OCS-A 0499)	COP, PPA, SAP					X		2024–2027	200	1,510	441	58	547	576	919	1,049
NY/NJ	Ocean Wind 2, OCS-A 0532	PPA					X	X	By 2030, spread over 2026–2030	111	1,554	120	5	173	512	788	906
NY/NJ	Empire Wind 1, part of OCS-A 0512	COP, PPA, SAP					X		2023–2026	57	816	46	5	133	525	853	951
NY/NJ	Empire Wind 2, part of OCS-A 0512	COP, PPA, SAP					X		2023–2027	90	1,260	30	5	166	525	853	951
NY/NJ	Atlantic Shores North, OCS-A 0549	SAP					X		By 2030, spread over 2026–2030	157	2,198	99	58	249	576	919	1,049
NY/NJ	OW Ocean Winds East LLC, OCS-A 0537						X		By 2030, spread over 2026–2030	100	1,200	120	5	157	492	722	853
NY/NJ	Attentive Energy LLC, OCS-A 0538						X		By 2030, spread over 2026–2030	102	1,224	120	5	160	492	722	853
NY/NJ	Bight Wind Holdings LLC, OCS-A 0539						X		By 2030, spread over 2026–2030	145	1,740	120	5	231	492	722	853
NY/NJ	Atlantic Shores Offshore Wind Bight LLC, OCS-A 0541						X		By 2030, spread over 2026–2030	93	1,116	120	5	147	492	722	853
NY/NJ	Invenergy Wind Offshore LLC, OCS-A 0542						X		By 2030, spread over 2026–2030	97	1,164	120	5	153	492	722	853
NY/NJ	Vineyard Mid-Atlantic LLC, OCS-A 0544						X		By 2030, spread over 2026–2030	102	1,224	120	5	160	492	722	853
	Total NY/NJ Leases									**1,352**	**16,106**	**1,650**		**2,466**			
Maryland/Delaware Region																	
DE/MD	Skipjack, part of OCS-A 0519	COP, PPA, SAP					X		2024	16	120	40	10	30	492	722	853
DE/MD	US Wind, part of OCS-A 0490	COP, PPA, SAP					X		2024–2027	121	2,000	146	7	152	528	820	938
DE/MD	GSOE I, OCS-A 0482	Collectively the technical capacity of this is group is 1,080 MW (90 turbines). The remaining capacity may be utilized by demand from NJ or MD.					X		By 2030, spread over 2023–2030	90	1,080	-	-	-	492	722	853
DE/MD	OCS-A 0519 remainder						X					-	-	-			
DE/MD	Remaining DE/MD Lease Area Total									90	1,080	240	5	139			
	Total DE/MD Leases									**227**	**3,200**	**426**		**321**			
Virginia/North Carolina Region																	
VA/NC	CVOW-C, OCS-A 0483	COP, SAP					X		2025–2027	205	3,000	417	5	301	489	761	869

Region	Lease, Project, Lease Remainder[1]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[3]						Estimated Construction Schedule[4]	Turbine Number[5]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles)[6]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Interarray Cable Length (statute miles)[7]	Hub Height (feet)[8]	Rotor Diameter (feet)[8]	Height of Turbine (feet)[8]
			Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism									
VA/NC	Kitty Hawk North, OCS-A 0508	COP, SAP					X		2024–2030	69	1,242	100	30	149	574	935	1,042
VA/NC	Kitty Hawk South, OCS-A 0508	COP					X		2024–2027	121	1,242	353	30	200	574	935	1,042
	Total VA/NC Leases									**395**	**5,484**	**870**		**650**			
	OCS Total (Planned)[9,10]									**2,948**	**38,038**	**5,626**		**5,522**			

Projects in *italics* are projects that have already been constructed or that are ongoing projects. Completed and ongoing projects are not included in project totals.

1 The spacing/layout for projects are as follows: NE State water projects include a single strand of WTGs and no OSS. For projects in the RI, MA, NY, NJ, DE, MD lease areas, a 1×1–nm grid spacing is assumed. For the CVOW-C Project, the spacing is 0.7 nm; and the Dominion commercial lease area off the coast of Virginia would utilize 0.5 nm average spacing, which is less than the 1×1–nm spacing due to the need to attain the state's goals.

2 Because development could occur anywhere within the RI and MA lease areas and assumes a continuous 1x1–nm grid, the actual development for these projects is expected to be approximately 73% of the collective technical capacity. Under the scenario described in this appendix, the total area in the RI and MA lease areas is greater than the area needed to meet state demand. Therefore, if a project is not constructed, BOEM assumes that another future project would be constructed to fulfill the unmet demand.

3 This column identifies lease areas that are applicable to each resource based on the geographic analysis areas.

4 The estimated construction schedule is based on information known at the time of this analysis and could be different when an applicant submits a COP.

5 The number of turbines for those lease areas without an announced number of turbines has been calculated based on lease size, a 1×1-nm grid spacing, and/or the generating capacity.

6 BOEM assumes that each offshore wind development would have its own cable (both onshore and offshore) and that future projects would not utilize a regional transmission line. The length of offshore export cable for those lease areas without a known project size is assumed to include two offshore cables totaling 120 miles (193 kilometers). The offshore export cable would be buried a minimum of 4 feet (1.8 meters) but not more than 10 feet (3.1 meters).

7 If information for a future project could not be obtained from a COP, the length of interarray cabling is assumed to be the average amount per foundation based on the COPs submitted to date, which is 1.48 miles (2.4 kilometers). In addition, for those lease areas that require more than one OSS, it is assumed that an additional 6.2 miles (9.9 kilometers) of inter-link cable would be required to link the two OSS. Interarray cable is assumed to be buried between 4 and 6 feet.

8 The hub height, rotor diameter, and turbine height for lease areas is based on worst-case scenario for the resource area. Presentation of heights vary by COP and may be presented relative to MLLW, mean sea level, or height above highest astronomical tide.

9 BOEM recognizes that the estimates presented within this analysis are likely high, conservative estimates; however, BOEM believes that this analysis is appropriately capturing the potential cumulative impacts and errs on the side of maximum impacts. Totals by lease area and by OCS may not fully sum due to rounding errors.

10 New York's demand is not double-counted; this total comes from looking at New York's state demand, not adding up the potential of the areas because that would double-count New York.

CT = Connecticut; CVOW = Coastal Virginia Offshore Wind; DE = Delaware; FDR = Facility Design Report; FIR = Fabrication and Installation Report; MA = Massachusetts; MD = Maryland; NE = New England; NJ = New Jersey; NY = New York; PPA = Power Purchase Agreement; RAP = research activities plan; RI = Rhode Island

11 Includes cable length from offshore export cables and substation interconnector cables.

Table E2-2 Offshore Wind Development Activities on the U.S. East Coast: Projects and Assumptions (Part 2, Seabed/Anchoring Disturbance and Scour Protection)

Region	Lease/Project/Lease Remainder[1]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps analysis area)[3]						Estimated Foundation Number[2]	WTG Foundation Footprint[3] (acres)	WTG Seabed Disturbance (Foundation + Scour Protection) (acres)[4]	Offshore Export Cable Seabed Disturbance (acres)[5]	Offshore Export Cable Operating Seabed Footprint (acres)[6]	Offshore Export Cable Hard Protection (acres)[7]	Anchoring Disturbance (acres)[8]	Interarray Construction Footprint/Seabed Disturbance (acres)[9]	Interarray Operating Footprint/ Seabed Disturbance (acres)[10]	Interarray Cable Hard Protection (acres)[11]
			Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism										
MA/RI	Sunrise, OCS-A 0487	COP, PPA, SAP	X	X	X	X	X	X	95	3	108	1259	102	25	11	462	145	129
MA/RI	Revolution, part of OCS-A 0486	COP, PPA, SAP	X		X		X	X	83	3	44	481	84	42	667	469	109	43
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	COP, PPA, SAP					X	X	65	1.7	86	263	22	22	34	222	92	129
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	COP, PPA, SAP					X	X	82	2.7	98	243	32	32	50	321	117	14
MA/RI	Mayflower OCS-A 0521	COP, PPA, SAP					X	X	149	139	1697	2480	586	471	442	1408	213	122
MA/RI	Beacon Wind 1, part of OCS-A 0520	PPA, SAP					X	X	106	5	265	143	95	43	442	247	152	152
MA/RI	Beacon Wind 2, part of OCS-A 0520	SAP					X	X										
MA/RI	Bay State Wind, part of OCS-A 0500	SAP, COP (unpublished); the MW is included in the description below in the 5,148 MW	X		X		X	X	112	11	112	143	95	43	442	264	160	0
MA/RI	Liberty Wind, part of OCS-A 0522	This group is exposed to 5,800 MW of demand—for MA (4,000 MW remaining), CT (900 MW remaining), and RI (900 MW expected). Collectively the remaining technical capacity is 5,148 MW					X	X	337	33.7	337	856	567	257	72	775	482	0
MA/RI	OCS-A 0500 remainder						X	X										
MA/RI	OCS-A 0487 remainder						X	X										
MA/RI	Remaining MA/RI Lease Area Total	73%							449	45	449	999	662	300	514	1,039	642	0
	Total MA/RI Leases								**1,029**	**199**	**2,747**	**5,868**	**1,583**	**935**	**2,160**	**4,168**	**1,470**	**589**
	NJ, NY, DE, MD, NC, VA Leases								**2,659**	**405**	**6,213**	**146,189**	**3,396**	**1,952**	**4,169**	**26,652**	**3,998**	**1,286**
	OCS Total								**3,016**	**260**	**4,604**	**150,280**	**2,465**	**1,523**	**2,402**	**34,299**	**4,534**	**1,139**

1 This column identifies lease areas that are applicable to each resource based on the geographic analysis areas.
2 The estimated number of foundations is the total number of turbines plus OSS. If information for a future project could not be obtained from a publicly available COP, it is assumed that for every 50 turbines there would be one OSS installed.
3 If information for a future project could not be obtained from a publicly available COP, the foundation footprint is assumed to be 0.04 acre, which is based on the largest monopile reported (12 MW) for all lease areas.
4 The seabed disturbance with the addition of scour protection was calculated based on scour protection expected in submitted COPs. If information for a future project could not be obtained from a publicly available COP, it is assumed that for all lease areas that a 12-MW foundation with addition of scour protection would be 0.85 acre per foundation.
5 Offshore export cable seabed bottom disturbance is assumed to be due to installation of the export cable, the use of jack-up vessels, and the need to perform dredging. If information for a future project could not be obtained from a publicly available COP, export cable seabed disturbance assumed to be 6.06 acres per mile.
6 If information for a future project could not be obtained from a publicly available COP, the offshore export cable operating seabed footprint assumed to be 0.4 acre per mile.
7 If information for a future project could not be obtained from a publicly available COP, the offshore export cable hard protection is assumed to be similar to Vineyard Wind 1 Project, which is 0.357 acre per mile of offshore export cable.
8 If information for a future project could not be obtained from a publicly available COP, anchoring disturbance for other lease areas is assumed to be a rate equal to 0.10 acre per mile of offshore export cable.
9 If information for a future project could not be obtained from a publicly available COP, interarray construction seabed disturbance is assumed to be 6.06 acres per mile.
10 If information for a future project could not be obtained from a publicly available COP, the interarray operating footprint is assumed to be a rate equal to the average amount per foundation of 1.43 acres per foundation.
11 If information for a future project could not be obtained from a publicly available COP, the interarray cable hard protection is assumed to be zero.

Table E2-3 Offshore Wind Development Activities on the U.S. East Coast: Projects and Assumptions (Part 3, Gallons of Coolant, Oils, Lubricants, and Diesel Fuel)

Region	Lease/Project/Lease Remainder[1]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps analysis area)[1] Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism	Total Coolant Fluids in WTGs (gallons)	Total Coolant Fluids in OSS or ESP (gallons)	Total Oils and Lubricants in WTGs (gallons)	Total Oils and Lubricants in OSS or ESP (gallons)	Total Diesel Fuel in WTGs (gallons)	Total Diesel Fuel in OSS or ESP (gallons)
MA/RI	Sunrise, OCS-A 0487	COP, PPA, SAP	X	X	X	X	X	X	350,268	46	307,326	199,956	80,886	24,304
MA/RI	Revolution, part of OCS-A 0486	COP, PPA, SAP	X			X	X	X	42,300	23	383,000	61,780	9,516	52,834
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	COP, PPA, SAP					X	X	314,470	4,226	165,106	371,956	98,271	10,935
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	COP, PPA, SAP					X	X	475,826	9,510	249,798	557,934	146,087	24,604
MA/RI	Mayflower OCS-A 0521	COP, PPA, SAP					X	X	73,500	1,500	433,650	755,000	132,300	200,000
MA/RI	Beacon Wind 1, part of OCS-A 0520	PPA, SAP					X	X						
MA/RI	Beacon Wind 2, part of OCS-A 0520	SAP					X	X						
MA/RI	Bay State Wind, part of OCS-A 0500	SAP, COP (unpublished); the MW is included in the description below in the 5,148 MW	X			X	X	X						
MA/RI	Liberty Wind, part of OCS-A 0522	This group is exposed to 5,800 MW of demand—for MA (4,000 MW remaining), CT (900 MW remaining), and RI (900 MW expected). Collectively the remaining technical capacity is 5,148 MW					X	X	136,6298	322	1,237,090	864,913	256,139	
MA/RI	OCS-A 0500 remainder						X	X						
MA/RI	OCS-A 0487 remainder						X	X						105,668
MA/RI	Remaining MA/RI Lease Area Total	73%							183,159	368	1,658,390	988,472	343,369	145,540
	Total MA/RI Leases								1,480,731	15,723	3,267,002	3,076,922	889,729	463,913
	NJ, NY, DE, MD, NC, VA Leases								3,548,811	37,260	8,460,822	8,739,555	2,246,025	1,526,154
	OCS Total								**4,003,402**	**40,077**	**8,639,105**	**8,601,636**	**2,171,556**	**2,510,764**

[1] This column identifies lease areas that are applicable to each resource based on the geographic analysis areas.

[2] Quantities of coolant, oil and lubricants, and diesel fuel are scaled to Ocean Wind 1 based on number turbines and OSS.

[3] Quantities of coolant, oil and lubricants, and diesel fuel are scaled to Atlantic Shores South based on number turbines and OSS. ESP = electrical service platform; NJ = New Jersey; NY = New York; PPA = Power Purchase Agreement

Table E2-4 Offshore Wind Development Activities on the U.S. East Coast: Projects and Assumptions (Part 4, OCS Construction and Operations Emissions)

Region	Lease/Project/ Lease Remainder[1]	Status	Construction Emissions NOx (tons)	Construction Emissions VOC (tons)	Construction Emissions CO (tons)	Construction Emissions PM10 (tons)	Construction Emissions PM2.5 (tons)	Construction Emissions SO2 (tons)	Construction Emissions CO2 (tons)	Operation Emissions NOx (tpy)	Operation Emissions VOC (tpy)	Operation Emissions CO (tpy)	Operation Emissions PM10 (tpy)	Operation Emissions PM2.5 (tpy)	Operation Emissions SO2 (tpy)	Operation Emissions CO2 (tpy)
			Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air
NE	NE Aquaventus (state waters)	State Project	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NE	Block Island (state waters)	State Project, Built	585.96	25.73	101.16	37.15	NA	0.424	42,940.00	21.40	0.80	2.80	1.40	NA	0.01	1,572.00
	Total State Waters		**585.96**	**25.73**	**101.16**	**37.15**	**NA**	**0.424**	**42,940.00**	**21.40**	**0.80**	**2.80**	**1.40**	**NA**	**0.01**	**1,572.00**
MA/RI	Vineyard Wind 1 part of OCS-A 0501	COP, PPA, ROD														
MA/RI	South Fork, OCS-A 0517	COP, PPA, ROD	1,451	59	284	49	47	33	97,026	281	6	58	10	10	2	18,894
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	COP, PPA, SAP	237.80	5.61	98.79	4.39	4.39	2.73	30,627.80	31.21	0.55	7.65	1.06	0.98	0.10	2,665.08
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	COP, PPA, SAP	1,255.64	26.73	292.36	50.36	48.73	7.45	85,811.09	76.18	1.35	18.55	2.55	2.36	0.24	7,704.73
MA/RI	Mayflower (North), part of OCS-A 0521	COP, PPA, SAP														
MA/RI	Revolution Wind, OCS-A 0486	COP, PPA, SAP														
MA/RI	Beacon Wind 1, part of OCS-A 0520	PPA, SAP														
MA/RI	Beacon Wind 2, part of OCS-A 0520	SAP														
MA/RI	Bay State Wind, part of OCS-A 0500	SAP, COP (unpublished), the MW is included in the description below														
MA/RI	Liberty Wind, OCS-A 0522	This group is exposed to 5,800 MW of demand—for MA (4,000 MW remaining), CT (900 MW remaining), and RI (900 MW expected). Collectively the remaining technical capacity is 5,148 MW.														
MA/RI	OCS-A 0500 remainder															
MA/RI	OCS-A 0487 remainder															
	Remaining MA/RI Lease Area Total[2]	73%	16,388.00	401.00	3,686.00	569.00	547.00	127.00	1,052,650.00	234.00	7.00	60.00	8.00	8.00	1.00	18,126.00
	Total MA/RI Leases (without Proposed Actions)[2]		**17,881.44**	**433.33**	**4,077.15**	**623.76**	**600.12**	**137.18**	**1,169,088.89**	**341.39**	**8.90**	**86.20**	**11.61**	**11.35**	**1.33**	**28,495.80**

1. The spacing/layout for projects/regions are as follows: NE State water projects include a single strand of WTGs and no OSSs; for projects in the RI and MA Lease Areas, a 1 × 1–nm grid spacing is assumed; for the projects in the New Jersey/New York and the Delaware/Maryland lease areas, BOEM assumes that a 1 × 1–nm grid spacing also would be utilized; for the Coastal Virginia Offshore Wind Project, the spacing is 0.7 nm; and the Dominion commercial lease area off the coast of Virginia would utilize 0.5 nm average spacing, which is less than the 1 × 1–nm spacing due to the need to attain the state's goals.

2. Because development could occur anywhere within the RI and MA Lease Areas and assumes a continuous 1 x 1–nm grid, the actual development for these projects is expected to be approximately 73% of the collective technical capacity. Under the cumulative scenario described in in this appendix (Appendix E), the total area in the RI and MA Lease Areas is greater than the area needed to meet state demand. Therefore, if a project is not constructed, BOEM assumes that another future project would be constructed to fulfill the unmet demand.