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New York Bight Draft Programmatic Environmental Impact Statement

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Appendix A: Consultation and Coordination

A.1 Introduction

This appendix discusses public, agency, and tribal involvement leading up to the preparation and publication of the New York Bight (NY Bight) Draft Programmatic Environmental Impact Statement (PEIS), including formal consultations, cooperating and participating agency and Cooperating Tribal Government exchanges, the public scoping comment period, and other correspondence. Interagency consultation, coordination, and correspondence throughout the development of the Draft PEIS occurred primarily through virtual meetings, teleconferences, and written communications (including email).

A.2 Consultations

A.2.1 Endangered Species Act

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA), as amended (16 United States Code [U.S.C.] 1531 et seq.), requires that each federal agency ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of those species. When the action of a federal agency could affect a protected species or its critical habitat, that agency is required to consult with either the National Marine Fisheries Service (NMFS) or U.S. Fish and Wildlife Service (USFWS), depending upon the jurisdiction of the services. Pursuant to 50 Code of Federal Regulations (CFR) 402.07, the Bureau of Ocean Energy Management (BOEM) has accepted designation as the lead federal agency for the purposes of fulfilling interagency consultation under Section 7 of the ESA for listed species under the jurisdiction of NMFS and USFWS. BOEM is developing Programmatic Biological Assessments for listed species and designated critical habitats under NMFS and USFWS jurisdictions.

A.2.2 Tribal Consultation

Executive Order 13175 commits federal agencies to engage in government-to-government consultation with Tribal Nations when federal actions have tribal implications. A June 29, 2018, memorandum outlines BOEM's current tribal consultation policy (BOEM 2018). This memorandum states that "consultation is a deliberative process that aims to create effective collaboration and informed federal decision-making" and is in keeping with the spirit and intent of Executive Order 13175 (BOEM 2018). BOEM implements tribal consultation policies through formal government-to-government consultation, informal dialogue, collaboration, and other engagement.

On November 30, 2022, in conjunction with a White House Tribal Summit held at the Department of the Interior, the Biden-Harris administration issued several directives and updates on Tribal policies including: Presidential Memorandum on Uniform Standards for Tribal Consultation (November 30, 2022); Department of the Interior Policy on Consultation with Indian Tribes (November 30, 2022); Department of the Interior Procedures for Consulting with Indian Tribes (November 30, 2022);

Department of the Interior Policy on Consultation with Alaska Native Claims Settlement Act Corporations (November 30, 2022); Department of the Interior Procedures for Consultation with Alaska Native Claims Settlement Act Corporations (November 30, 2022); Best Practices for Identifying and Protecting Tribal Treaty Rights, Reserved Rights and Other Similar Rights in Federal Regulatory Actions and Federal Decision-Making (Draft September 2022); Guidance for Federal Departments and Agencies on Indigenous Knowledge (November 30, 2022); Memorandum on Implementation of Guidance for Federal Departments and Agencies on Indigenous Knowledge (November 30, 2022); Collaborative and Cooperative Stewardship with Tribes and the Native Hawaiian Community Chapter 1: Policy and Responsibilities (November 30, 2022); and Collaborative and Cooperative Stewardship with Tribes and the Native Hawaiian Community Chapter 2: Committee on Collaborative and Cooperative Stewardship (November 30, 2022). Finally, on April 21, 2023, President Biden issued Executive Order 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All, which includes coverage for Tribal Nations.[1]

On July 7, 2022, BOEM informed tribal leaders via email of the purpose of and anticipated publication date for the Notice of Intent (NOI) to prepare a PEIS for the NY Bight lease areas. On July 15, 2022, BOEM sent individual letters via email to tribal leaders with the Absentee-Shawnee Tribe of Indians of Oklahoma, The Delaware Nation, Delaware Tribe of Indians, Eastern Shawnee Tribe of Oklahoma, Mashpee Wampanoag Tribe, Mashantucket (Western) Pequot Tribal Nation, Mohegan Tribe of Connecticut, Shawnee Tribe, Stockbridge-Munsee Community Band of Mohican Indians, The Narragansett Indian Tribe, The Shinnecock Indian Nation, and the Wampanoag Tribe of Gay Head (Aquinnah). These letters notified them that the NOI to prepare a PEIS for the NY Bight lease areas was issued that day and noted that the scoping comment period was open until August 15, 2022. Additionally, the letters initiated formal consultation with twelve Tribes under the National Historic Preservation Act (NHPA) and invited them to be NHPA Section 106 consulting parties and Cooperating Tribal Governments for the PEIS. One tribal leader initially responded that they would not like to participate in discussions related to the NY Bight PEIS: the Mashantucket (Western) Pequot Tribal Nation. As of April 19, 2023, Michael Kickingbear Johnson, Mashantucket Pequot (Western) Tribal Historic Preservation Officer (THPO) informed BOEM that the Mashantucket (Western) Pequot Tribal Nation, "are again revising [their] areas of interest by expanding them." BOEM has established a Cooperating Tribal Government relationship with the Tribe and has added them to the NHPA Consultation list. The Stockbridge-Munsee Community Band of Mohican Indians have also agreed to be a Cooperating Tribal Government on the NY Bight PEIS.

On September 21, 2022, a virtual meeting was held with Delaware Tribe of Indians, Stockbridge-Munsee Community Band of Mohican Indians, and Shinnecock Indian Nation distinguishing the NY Bight, Empire Wind, and Atlantic Shores lease areas. During that meeting, they requested a geophysical map, location(s) of trenches for transmission lines, key observation points (KOPs), as well as information on radiant heat from cables, how turbines may affect surface ocean temperatures, and how build out may

[1] Executive Order 14096 further embeds "environmental justice agenda into the work of federal agencies to achieve real, measurable progress that communities can count on." This executive order and subsequent guidance will be incorporated into the Final PEIS.

affect migration patterns of keystone species, marine mammals, and ESA-listed species. A draft list of KOPs for the NY Bight lease areas was shared with all Section 106 consulting parties, which includes all invited Tribal Nations who did not decline the invitation to consult. Information regarding transmission lines for the NY Bight lease areas is currently unknown and will be shared at the project-specific stage.

Additionally, the following Tribes were invited to participate in quarterly Environmental Justice Forums, beginning in October 2022: the Mashpee Wampanoag, Aquinnah Wampanoag, Mohegan, Stockbridge-Munsee Community Band of Mohican Indians, Delaware Tribe of Indians, The Delaware Nation, The Narragansett Indian Tribe, Shinnecock Indian Nation, Shawnee Nation, Eastern Shawnee Tribe of Oklahoma, and Absentee-Shawnee Tribe of Indians of Oklahoma. Impacts from noise on marine mammals was discussed during the Environmental Justice Forums, and supporting resources were also shared with participants. See Section 3.6.4.1.6, *Environmental Justice Engagement,* for more information on the Environmental Justice Forums.

On November 2, 2022, the NY Bight PEIS was discussed on the Atlantic Quarterly meeting tribal call with BOEM Director Amanda Lefton. On January 10, 2023, BOEM held a virtual meeting to share the location of the NY Bight lease areas including a map of the bathymetry, areas of cultural significance for consideration as KOPs, a field opportunity to Block Island, Native American history, and their connection to the shipwrecks. The following representatives attended: Carissa Speck, Delaware Nation Historic Preservation Director; Katelyn Lucas, Delaware Nation Historic Preservation Assistant; Jeff Bendremer, Registered Professional Archaeologist, Stockbridge-Munsee THPO; Susan Bachor, Delaware Tribe THPO and Archaeologist; Kevin Devine, Aquinnah Wampanoag Tribal Council; Jeremy Dennis, Shinnecock Indian Nation Assistant THPO; Kelly Dennis, Shinnecock Council of Trustees Secretary (and Secretary's Tribal Advisory Committee member); and Kelsey Leonard, Shinnecock Tribal Member (and Committee on Offshore Science and Assessment member). On April 27, 2023, Erin Paden, Shawnee Tribe THPO asked to be taken off all NY Bight related correspondence. As of October 2023, no Tribes have requested formal government-to-government consultation on the NY Bight PEIS.

A.2.3 National Historic Preservation Act

Section 106 of the NHPA (54 U.S.C. 306108) and its implementing regulations (36 CFR part 800) require federal agencies to consider the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. In anticipation of the project-level review of Construction and Operation Plans (COPs) for each of the NY Bight lease areas, BOEM has identified an opportunity to engage the appropriate federally recognized Tribes, State Historic Preservation Offices (SHPO) and consulting parties to develop a Programmatic Agreement that outlines the project-level review process; identifies avoidance, minimization, mitigation, and monitoring (AMMM) measures; and provides templates for key documents that may be required in the course of project-level Section 106 consultation. Appendix I, *NHPA Section 106 Summary*, of the Draft PEIS contains a summary of BOEM's Section 106 programmatic review, including a description and summary of BOEM's consultation so far.

On July 15, 2022, BOEM contacted representatives of other federal agencies, federally recognized Tribes, state and local governments, preservation organizations, lessees of the six NY Bight lease areas and other potentially interested parties to determine their interest in participating in the programmatic Section 106 review as consulting parties. Invitations were extended to additional organizations as they were identified. Those parties that have confirmed their desire to participate in the programmatic Section 106 review of the NY Bight as of December 1, 2023, are listed in Table A1.

BOEM conducted Section 106 early coordination meetings with ACHP on September 7, 2022, and with the New Jersey and New York SHPOs and ACHP on September 21, 2022, and January 10, 2023. BOEM conducted a Section 106 consultation meeting with consulting parties on March 13, 2023 to introduce the objectives for the NY Bight programmatic Section 106 review and solicit input on the development of the Programmatic Agreement. BOEM conducted a second Section 106 consultation meeting on August 3, 2023 to present an introduction to BOEM's analysis of impacts on scenic and visual resources including a preview of the development of photo simulations of development scenarios for the NY Bight lease areas and to provide an overview of BOEM's progress on the development of the Programmatic Agreement.

In the course of consultation activities, BOEM has identified additional organizations or agencies that may have an interest in the effects of offshore wind development on cultural resources and has continued to invite such parties to participate in the programmatic Section 106 review. BOEM will continue consulting with federally recognized Tribes, New Jersey SHPO, New York SHPO, ACHP, and other consulting parties regarding the project-level review procedures and the development of programmatic AMMM measures that could be adopted at the COP stage to resolve adverse effects on historic properties.

Table A1. Participating consulting parties for the NY Bight PEIS

Organization Type	Participating Consulting Parties
Federal Government	U.S. Advisory Council on Historic Preservation
Federal Government	U.S. Army Corps of Engineers
Federal Government	U.S. Bureau of Safety and Environmental Enforcement
Federal Government	U.S. Environmental Protection Agency
Federal Government	U.S. National Park Service
Federally Recognized Tribe	Absentee-Shawnee Tribe of Indians of Oklahoma
Federally Recognized Tribe	Delaware Tribe of Indians
Federally Recognized Tribe	Eastern Shawnee Tribe of Oklahoma
Federally Recognized Tribe	Mashantucket (Western) Pequot Tribal Nation
Federally Recognized Tribe	Mashpee Wampanoag Tribe
Federally Recognized Tribe	Mohegan Tribe of Connecticut
Federally Recognized Tribe	Stockbridge-Munsee Community Band of Mohican Indians
Federally Recognized Tribe	The Delaware Nation
Federally Recognized Tribe	The Narragansett Indian Tribe
Federally Recognized Tribe	The Shinnecock Indian Nation
Federally Recognized Tribe	Wampanoag Tribe of Gay Head (Aquinnah)
Lessee	Atlantic Shores Offshore Wind Bight (OCS-A 0541)

Organization Type	Participating Consulting Parties
Lessee	Attentive Energy (OCS-A 0538)
Lessee	Bluepoint Wind (OCS-A 0537)
Lessee	Community Offshore Wind (OCS-A 0539)
Lessee	Invenergy (OCS-A 0542)
Lessee	Vineyard Mid-Atlantic Offshore Wind (OCS-A 0544)
Local Government	Atlantic County
Local Government	Avon-by-the-Sea Borough
Local Government	Borough of Beach Haven
Local Government	Borough of Highlands
Local Government	Borough of Point Pleasant Beach
Local Government	Borough of Sea Bright
Local Government	Borough of Seaside Park
Local Government	Borough of Spring Lake
Local Government	Cape May County
Local Government	City of Absecon
Local Government	City of Asbury Park
Local Government	City of Hoboken
Local Government	Monmouth County
Local Government	Monmouth County Park System
Local Government	Nassau County
Local Government	Suffolk County
Local Government	Town of Babylon
Local Government	Town of Islip
Local Government	Town of Oyster Bay
Local Government	Township of Brick
Local Government	Township of Hamilton
Local Government	Township of Middletown
Local Government	Township of Stafford
Local Government	Village of Bellport
Local Government	Village of Patchogue
Other Potentially Interested Parties	Green-Wood Cemetery
Other Potentially Interested Parties	Hempstead Harbor Protection Committee
Other Potentially Interested Parties	Point O'Woods Association
Preservation Organization	Bay Shore Historical Society
Preservation Organization	Greater Cape May Historical Society
Preservation Organization	Historic Districts Council
Preservation Organization	Historical Society of Highlands
Preservation Organization	Ocean City Historical Museum
Preservation Organization	Preservation Alliance of Spring Lake
Preservation Organization	Romer Shoal Light
Preservation Organization	Save Long Island Beach Inc.
Preservation Organization	The Noyes Museum of Art

Organization Type	Participating Consulting Parties
Preservation Organization	West Bank Lighthouse
State Government	New Jersey State Museum
State Government	New York State Parks, Recreation & Historic Preservation, Long Island State Parks Region 9
State Government	New York State Parks, Recreation and Historic Preservation
State Government (SHPO)	New Jersey Department of Environmental Protection, Historic Preservation Office
State Government (SHPO)	New York State Historic Preservation Office
State Recognized Tribe	Lenape Indian Tribe of Delaware

A.2.4 Magnuson-Stevens Fishery Conservation and Management Act

Pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), federal agencies are required to consult with NMFS on any action that may result in adverse effects on Essential Fish Habitat (EFH). NMFS regulations implementing the EFH provisions of the MSA can be found at 50 CFR part 600. As provided for in 50 CFR 600.920(b), BOEM has accepted designation as the lead agency for the purposes of fulfilling EFH consultation obligations under Section 305(b) of the MSA. Certain Outer Continental Shelf (OCS) activities authorized by BOEM may result in adverse effects on EFH and, therefore, require consultation with NMFS. At this programmatic stage, an EFH Assessment and consultation are not being undertaken. Project-specific EFH Assessments will be prepared for each offshore wind project during the COP-specific NEPA process.

A.3 Development of Draft Environmental Impact Statement

This section provides an overview of the development of the Draft PEIS, including public scoping, cooperating agency involvement, and distribution of the Draft PEIS for public review and comment.

A.3.1 Scoping

On July 15, 2022, BOEM issued a NOI to prepare a PEIS consistent with National Environmental Policy Act (NEPA) regulations (42 U.S.C. 4321 et seq.) to assess the potential impacts of the Proposed Action and alternatives [87 *Federal Register* 42495]. The NOI commenced a public scoping process for identifying issues and potential alternatives for consideration in the PEIS. The formal scoping period was from July 15, 2022, through August 15, 2022, but was extended until August 30, 2022. BOEM held three virtual public scoping meetings on July 28, 2022, August 2, 2022, and August 4, 2022, to share information, solicit feedback, and to answer questions. Throughout the scoping period, federal agencies, Tribal Nations, and state and local governments, and the general public had the opportunity to help BOEM identify potentially significant resources and issues, impact-producing factors (IPFs), reasonable alternatives, and potential mitigation measures to analyze in the PEIS, as well as provide additional information. BOEM also used the NEPA scoping process to initiate the Section 106 consultation process under the NHPA (54 U.S.C. 300101 et seq.), as permitted by 36 CFR 800.2(d)(3), which requires federal agencies to assess the effects of projects on historic properties. The NOI requested comments from the public in written form, delivered by hand or by mail, or through the regulations.gov web portal.

BOEM received a total of 43 comments during the scoping period. BOEM reviewed and considered all scoping comments in the development of the Draft PEIS. A scoping summary report summarizing the submissions received and the methods for analyzing them is available in Appendix O, *Scoping Report*, of the PEIS. In addition, all public scoping comments received can be viewed online at http://www.regulations.gov by typing "BOEM-2022-0034" in the search field. As detailed in the scoping summary report, the resource areas or NEPA topics most referenced in the scoping comments were the Purpose and Need, the Proposed Action, Public Engagement, Commercial and For-Hire Recreational Fishing, Marine Mammals, Navigation and Vessel Traffic, and Scenic and Visual Resources.

A.3.2 Cooperating and Participating Agencies and Cooperating Tribal Governments

BOEM invited other federal agencies, Tribal Nations, and state and local governments to consider becoming cooperating agencies in the preparation of the Draft PEIS. According to Council of Environmental Quality (CEQ) guidelines, qualified agencies and governments are those with "jurisdiction by law or special expertise" (CEQ 1981). BOEM also invited agencies that do not have jurisdiction by law or special expertise but that have a vested interest in the Draft PEIS to engage as participating agencies. Agreeing to engage as a cooperating or participating agency allowed agencies the opportunity to participate in discussions and contribute to the development of the Draft PEIS.

BOEM held interagency meetings with cooperating and participating agencies on September 12, 2022, December 2, 2022, and August 7, 2023, to discuss the environmental review process, schedule, responsibilities, consultation, and potential alternatives. BOEM also met individually and in small groups with cooperating and participating agencies who requested additional discussion on the PEIS at various times throughout development of the Draft PEIS.

The following federal agencies, Tribal Nations, and state and local governments have supported preparation of the Draft PEIS as cooperating and participating agencies and Cooperating Tribal Governments:

Cooperating Agencies

- Bureau of Safety and Environmental Enforcement
- U.S. Coast Guard
- U.S. Environmental Protection Agency
- New Jersey Department of Environmental Protection
- National Park Service
- New Bedford Port Authority
- U.S. Fish and Wildlife Service
- National Marine Fisheries Service

- U.S. Army Corps of Engineers
- New York State Department of State
- Massachusetts Office of Coastal Zone Management
- New York State Department of Environmental Conservation
- New Jersey Board of Public Utilities

Cooperating Tribal Governments

- Mashantucket (Western) Pequot Tribal Nation
- Stockbridge-Munsee Community, Band of Mohican Indians

Participating Agencies

- New York City Mayor’s Office of Environmental Coordination

A.3.3 Distribution of the Draft Programmatic Environmental Impact Statement for Review and Comment

The Draft PEIS is available in electronic format for public viewing at https://www.boem.gov/renewable-energy/state-activities/new-york-bight. Hard copies of the Draft PEIS can be requested by contacting BOEM, Office of Environmental Programs in Sterling, Virginia at (703) 787-1703. Publication of the Draft PEIS initiates a 45-day comment period where government agencies, members of the public, and interested stakeholders can provide comments and input. BOEM will accept comments in any of the following ways:

- In hard copy form, delivered by mail, enclosed in an envelope labeled “NY BIGHT PEIS” and addressed to Chief, Division of Environmental Assessment, Office of Environmental Programs, Bureau of Ocean Energy Management, 45600 Woodland Road (VAM-OEP), Sterling, Virginia 20166.
- Through the regulations.gov web portal by navigating to https://www.regulations.gov/, searching for docket number “BOEM-2024-0001,” and clicking the “Comment” button. Enter your information and comment, then click “Submit Comment.”
- By attending one of the public meetings on the dates listed in the notice of availability and providing written or verbal comments.

BOEM will use comments received during the public comment period to inform its preparation of the Final PEIS, as appropriate. PEIS notification lists are provided in Appendix N, *Distribution List*.

A.4 References Cited

[BOEM] Bureau of Ocean Energy Management. 2018. Tribal consultation guidance. 2023 Jun 29. US Department of the Interior, Bureau of Ocean Energy Management. https://www.boem.gov/sites/default/files/about-boem/Public-Engagement/Tribal-Communities/BOEM-Tribal-Consultation-Guidance-with-Memo.pdf.

[CEQ] Council on Environmental Quality. 1981. Memorandum to agencies: Forty most asked questions concerning CEQ's National Environmental Policy Act regulation. Amended 1986. Washington (DC): Council on Environmental Quality. Report No.: 46 Fed. Reg. 18026. https://www.energy.gov/sites/prod/files/2018/06/f53/G-CEQ-40Questions.pdf.

Appendix B: Supplemental Information and Additional Figures and Tables

B.1 Climate and Meteorology

Conditions that affect the weather and climate in an area include wind speed and direction, air temperature, and precipitation. Long-term averages of these conditions produce the regional climate. Extreme meteorological conditions are produced in the Mid-Atlantic region of the United States during tropical and extra-tropical storms. Over the open ocean, meteorological characteristics are fundamentally influenced by oceanographic conditions and are therefore sometimes jointly discussed as “metocean” conditions. In temperate regions such as the Mid-Atlantic, several metocean conditions are highly seasonal and driven by both atmospheric and oceanic circulation patterns. Daily variability in meteorological conditions will drive fluctuations in wind farm power production and associated stresses on the wind turbine generators (WTGs), while long-term performance may be estimated based on the climatic conditions.

B.1.1 Regional Climate Overview

The Atlantic seaboard is classified as a mid-latitude climate zone based on the Köppen Climate Classification System. This larger region, which encompasses the Mid-Atlantic region, is characterized by mostly moist subtropical conditions, generally warm and humid in the summer with relatively mild winters (BOEM 2021a). Prevailing winds at the middle latitudes over North America occur mostly west to east (“westerlies”) and contribute to seasonal variability along the Atlantic seaboard (NJDEP 2010).

The New York Bight (NY Bight) region is an offshore area existing within the larger Mid-Atlantic region and extending generally northeast from Cape May in New Jersey to Montauk Point on the eastern tip of Long Island, New York (BOEM 2021b). However, the lease areas identified for the Programmatic Environmental Impact Statement (PEIS) extend generally northeast from Atlantic City, New Jersey, to the southern end of Long Island, New York (BOEM 2021b). Thus, the NY Bight lease areas span only part of the full NY Bight region and include areas offshore of the states of New Jersey and New York.

The six NY Bight lease areas identified in the PEIS, listed from north to south, include lease areas OCS-A-0544, -0537, -0538, -0539, -0541, and -0542. The northernmost NY Bight lease area, OCS-A-0544, is adjacent to the Empire Wind lease area, which is identified as OCS-A-0512. Similarly, the southernmost NY Bight lease areas OCS-A-0541 and OCS-A-0542 are approximately 30 miles northeast of the Ocean Wind 1 lease area, which is identified as OCS-A-0498. As such, climatic conditions reported for the Empire Wind lease area (OCS-A-0512) are representative of the northern portion of the six NY Bight lease areas, and climatic conditions reported for the Ocean Wind 1 lease area (OCS-A-0498) are representative of the southern portion of the six NY Bight lease areas. Together, the climatic conditions of the Empire Wind and Ocean Wind 1 lease areas are representative of the climatic conditions in the six NY Bight lease areas (referred to hereafter as NY Bight lease areas).

Consistent with the larger Mid-Atlantic region, the climate across New York State can be described as humid and continental (New York State Climate Action Council 2010). The climate across New Jersey State varies, with greater humidity near the coastal and southern part of the state than in the inland and northern regions (NJDEP 2010). The NY Bight region along the New York and New Jersey coasts experiences four distinct seasons with cold air temperatures during the winter months. Coastal areas along the NY Bight are especially prone to coastal storms and their associated effects, including heavy precipitation, high winds, and coastal flooding (New York State Climate Action Council 2010). Coastal storms are common in the vicinity of the NY Bight lease areas and include hurricanes and tropical storms during the warmer months (July to September), and northeasters or "nor'easters" (extratropical storms in which the winds in coastal areas blow from the northeast) during the cooler months (October to April). Extreme rainfall and flooding associated with storm events contribute to erosion of coastal wetland areas and inland areas adjacent to the shoreline (NJDEP 2010; New York State Climate Action Council 2010).

The North Atlantic Oscillation (NAO) also affects climate in the Northwest Atlantic on the scale of decades (NJDEP 2010; Townsend et al. 2004). The NAO is calculated as the wintertime pressure difference between the high-pressure system over the Azores Islands and the low-pressure system over Iceland (NJDEP 2010; Townsend et al. 2004). Shifts in the ratio of these pressures contribute to warmer or cooler average winters in the Northwest Atlantic, which through icing, fog, and other weather events can affect offshore construction and operational conditions for wind energy development. Since the late 1970s, warmer NAO conditions have persisted on average (NJDEP 2010; Townsend et al. 2004). The NAO may be influenced by the El Niño-Southern Oscillation, which is a large-scale, multi-year fluctuation in sea surface temperatures, referred to as sea surface temperature anomalies, in the Pacific Ocean (NJDEP 2010). The NAO may also be correlated with an 11-year solar cycle (IPCC 2021).

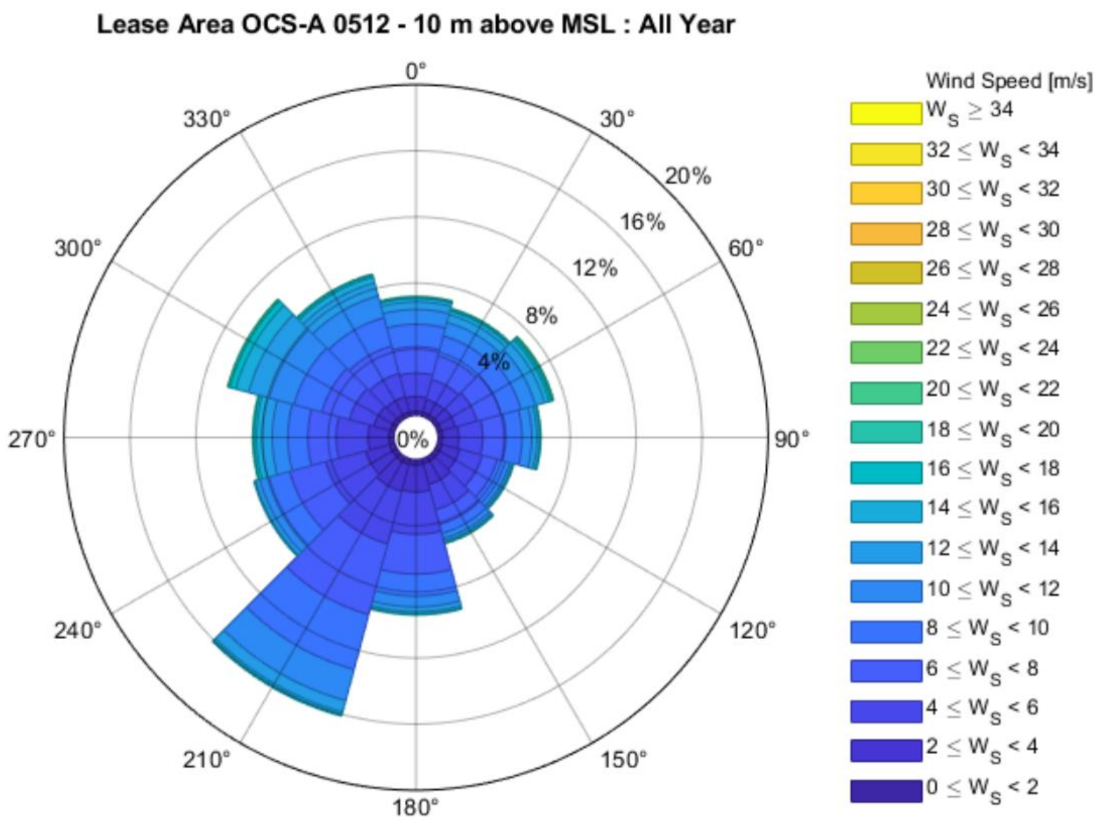
The United States Northeast region is currently subject to climate changes associated with global warming that are primarily attributed to human activities, especially the production of heat-trapping gases (i.e., greenhouse gases [GHG]) (Dupigny-Giroux et al. 2018; Hayhoe et al. 2018; IPCC 2021). These regional changes include an average winter-spring increase in air temperature of 1.67°F (increase of 0.93°C) between 1940 and 2014. By 2035, the Northeast region is expected to be 3.6°F (2°C) warmer on average than during the pre-industrial era (Dupigny-Giroux et al. 2018). The Northeast region has also seen a 55 percent increase in the number of heaviest 1-percent precipitation events between 1958 and 2016 (Dupigny-Giroux et al. 2018). Severe storms have become more frequent and more intense. Storm flood heights driven by hurricanes in New York City have increased by more than 3.9 feet (1.2 meters) over the last thousand years (Dupigny-Giroux et al. 2018). Due to predicted increases in average global temperatures, the frequency and intensity of extreme regional weather events such as heat waves, strong winds, and heavy precipitation are expected to increase in the coming decades (New York State Climate Action Council 2010; Dupigny-Giroux et al. 2018). In addition, the Northeast region has experienced some of the highest rates of sea level rise and ocean warming in the United States, and these exceptional increases relative to other regions are projected to continue through the end of the century (Dupigny-Giroux et al. 2018). Of note, since the retreat of the late Pleistocene glaciers after approximately 20,000 years before present, the New York and New Jersey coastline has been progressively inundated (BOEM 2012). At 21,000 years before present, sea level in the NY Bight area was approximately 394 feet (120 meters) below present levels, and at 14,400 years before present, the sea level was 256 feet (78 meters) lower (BOEM 2012; Wright et al. 2009). Studies have estimated that sea levels in the region were 43 feet (13 meters) lower than today at 6,000 years before present and 33 feet (10 meters) lower at 4,000 years before present (BOEM 2012; Miller et al. 2009). Refer to Section B.1.3 for additional information regarding projected future climate changes in the NY Bight area.

B.1.2 Current Meteorology and Climate Trends

B.1.2.1 Winds

Winds during the summer are typically from the southwest and flow parallel to the shore, while winds in the winter are typically from the northwest and flow perpendicular to the shore. Spring and fall are more variable, with wind currents from either the southwest or northeast (Schofield et al. 2008). Due to the large geographic region of the NY Bight, wind conditions are expected to vary throughout the region. As such, wind conditions of the northern and southern portions of the NY Bight are provided herein as representative wind conditions of the region encompassed by the NY Bight lease areas.

In the northern portion of the NY Bight, Empire Offshore Wind, LLC (Empire) has been collecting wind data, along with other directional wave and meteorological condition information, from a floating metocean buoy for 2 years. This metocean data will be used to inform final siting and design of the Empire Wind projects (OCS-A 0512) (Empire 2022a). Empire has also performed a preliminary metocean analysis using data from 2000 through 2020, which provides representative wind data for the northern portion of the NY Bight area. Winds measured in the northern portion of the NY Bight area are predominantly from the south to southwest and the northwest (Empire 2022a) as depicted on Figure B.1-1.



Source: Empire 2022a

Figure B.1-1. All-year wind rose at 33 feet (10 meters) AMSL for the Empire Wind lease area for 2002–2020

In addition to the wind data presented above, representative data for wind speed and wind direction are publicly available from NOAA's National Data Buoy Center for the Long Island buoy (Buoy No. 44025) (NOAA 2021a) and the New York Harbor Entrance buoy (Buoy No. 44065) (NOAA 2021b). The Long Island buoy is within the Empire Wind lease area at latitude 40.251, longitude -73.164 and is 30 nautical miles south of Islip, New York. The New York Harbor Entrance buoy is approximately 8 miles west of the Empire Wind lease area at latitude 40.369, longitude -73.703.

The most recent data available from the New York Harbor Entrance buoy are for January 2015 through December 2020. The maximum wind speed[1] recorded during this period was 47.4 mph (21.2 meters per second [m/s]) in 2018, with average wind speeds from 11.2 to 15.7 mph (5 to 7 m/s) across these 6 years (Table B.1-1). Using 2017 as an example year to consider seasonal averages, the maximum wind speed was recorded in the spring of 2017 at 47.0 mph (21 m/s), although the highest average seasonal wind speed of 16.8 mph (7.5 m/s) occurred in the winter of 2017 (Table B.1-2). The average wind direction for all seasons between 2015 and 2020 was from the southwest. In other years, higher maximum wind speeds have occurred in summer and fall months due to tropical cyclones. For example,

[1] NOAA buoy measurements for wind speed are averaged over an 8-minute period. Higher speeds are recorded for 5- to 8-second gusts.

a maximum sustained wind speed of 51.4 mph (23.0 m/s) and gusts up to 70.5 mph (31.5 m/s) were recorded at the New York Harbor Entrance buoy on August 4, 2020, in association with Hurricane Isaias (NOAA 2021b).

Table B.1-1. Annual average and maximum wind speed and direction at New York Harbor Entrance buoy (Buoy No. 44065) from January 2015 to December 2020

Year	Average Wind Speed		Maximum Wind Speed		Average Wind Direction
	mph	m/s	mph	m/s	Degrees from True North
2015	14.1	6.3	41.6	18.6	202 (Southwest)
2016	14.5	6.5	45.0	20.1	200 (Southwest)
2017	14.3	6.4	47.0	21.0	198 (Southwest)
2018	14.1	6.3	47.4	21.2	191 (Southwest)
2019	14.1	6.3	42.9	19.2	192 (Southwest)
2020	13.9	6.2	51.4	23.0	196 (Southwest)

Source: NOAA 2021b.
Note: NOAA buoy measurements for wind speed are averaged over an 8-minute period.

Table B.1-2. Seasonal average and maximum wind speed and direction at New York Harbor Entrance buoy (Buoy No. 44065) in 2017

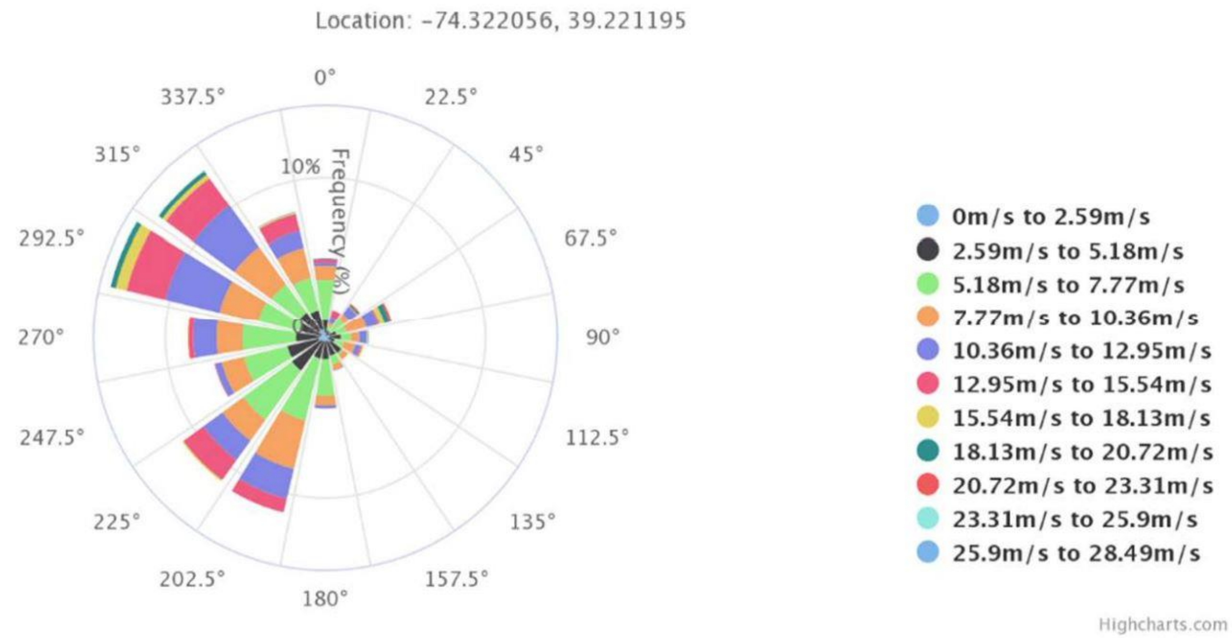
Season	Average Wind Speed		Maximum Wind Speed		Average Wind Direction
	mph	m/s	mph	m/s	Degrees from True North
Winter	16.8	7.5	44.3	19.8	223.9 (Southwest)
Spring	14.5	6.5	47.0	21.0	187.0 (South)
Summer	11.4	5.1	30.4	13.6	183.5 (South)
Fall	15.2	6.8	39.1	17.5	197.8 (Southwest)

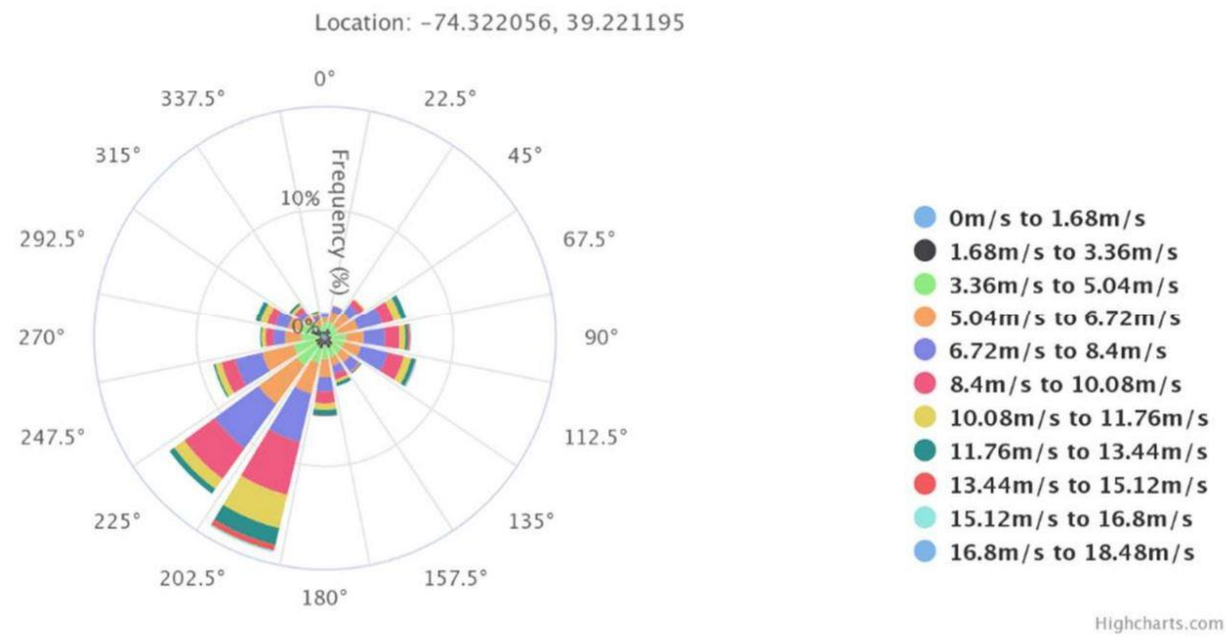
Source: NOAA 2021b.
Note: NOAA buoy measurements for wind speed are averaged over an 8-minute period.

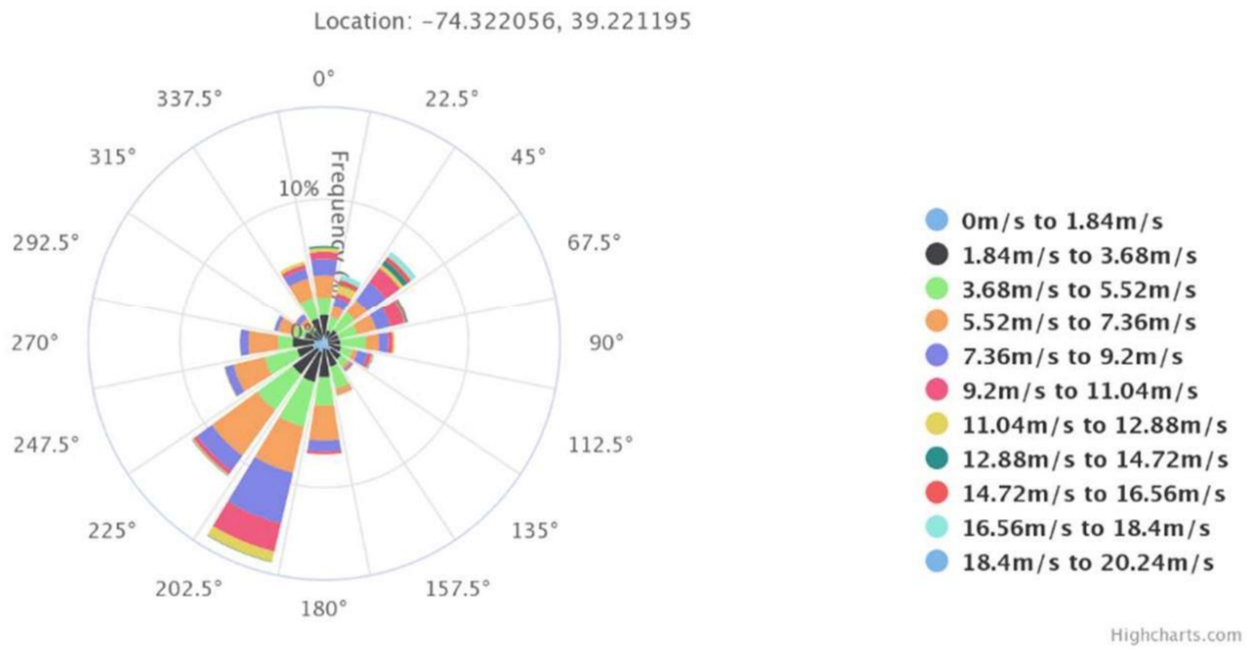
Data from the Long Island buoy (Buoy No. 44025) are available for October 1975 through December 2008. The Long Island buoy measured similar conditions as the New York Harbor Entrance buoy with a maximum wind speed of 51.0 mph (22.8 m/s) in 1991 and average wind speeds from 11.2 to 18.9 mph (5.0 to 8.4 m/s) across the 34 years recorded (NOAA 2021a).

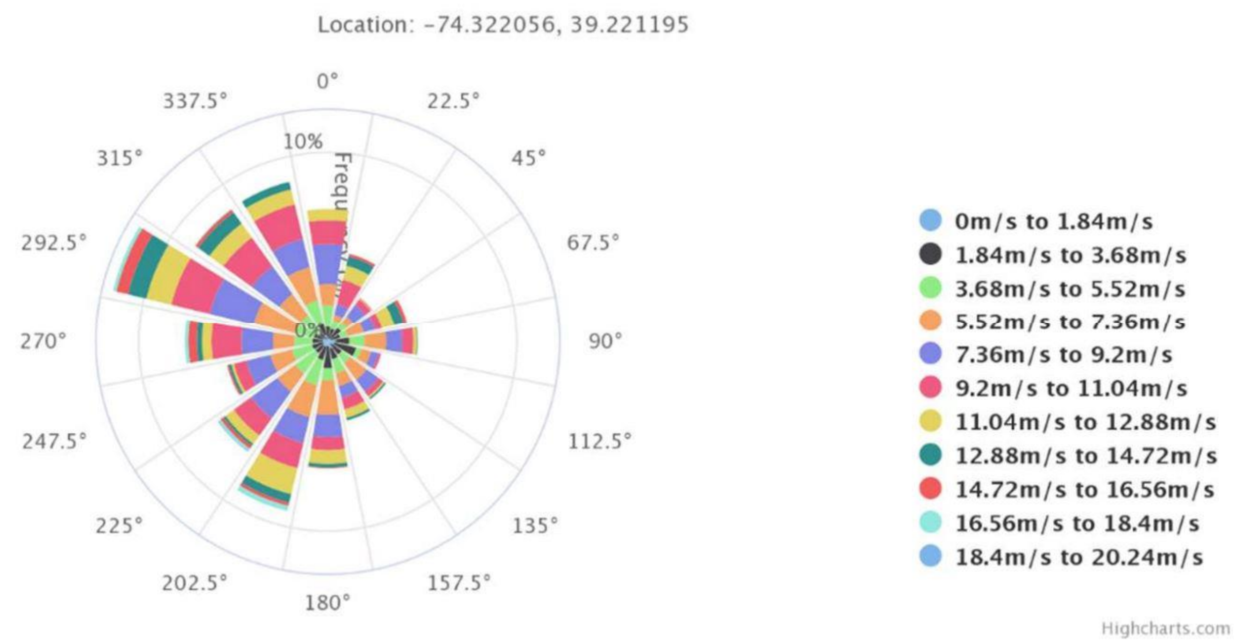
At the southern end of the NY Bight, Ocean Wind has been collecting wind and wave data from two stations in the Ocean Wind 1 lease area (OCS-A 0498): stations F220 and F230. In addition, the Metocean Data Portal, maintained by the Danish Hydrological Institute, provides wind data for the entire United States East Coast that has been generated through numerical models (Danish Hydrological Institute 2018). Data for the Ocean Wind 1 lease area were generated using a location within the Ocean Wind 1 lease area. Data from 2017 indicate wind speeds reached 63.8 miles per hour (28.5 m/s). The highest-frequency wind directions generally were from south-southwest to northwest. Throughout the year, wind direction is variable. However, seasonal wind directions are primarily from the west/northwest during the winter months (December through February) and from the south/southwest during the summer months (June through August). Figure B.1-2 shows 3-month wind roses for January through June 2017 and July through December 2017, respectively, for a location within the Ocean Wind 1 lease area (-74.322056, 39.221195). Top wind speeds within the Ocean Wind 1 lease area peaked between January and March at 40.6 to 46.3 mph (18.1 to 20.7 m/s) from the northwest.

Extreme wind conditions on the United States East Coast are influenced by both winter storms and tropical systems. Several nor'easters occur each winter season, while hurricanes are rarer but potentially more extreme. The tropical systems therefore define the wind farm design, based on extreme wind speeds (those with recurrence periods of 50 years and beyond). Wind roses developed from the Metocean Data Portal are provided below in Figure B.1-2 (Danish Hydrological Institute 2018).









Source: Danish Hydrological Institute 2018.
Note: Wind roses identified from top to bottom: January through March 2017 (first row); April through June 2017 (second row); July through September 2017 (third row); October through December 2017 (fourth row).

Figure B.1-2. Wind rose graphs for the Ocean Wind 1 lease area

Table B.1-3 summarizes wind conditions in the region. This table shows the monthly average wind speeds, monthly average peak wind gusts, and hourly peak wind gusts for each individual month. Data from 1984 through 2008 show that monthly mean wind speeds range from a low of 10.9 mph (17.6 kilometers per hour [kph]) in July to a high of 17.4 mph (28.0 kph) in January. The monthly wind mean peak gusts reach a maximum during January at 24.1 mph (38.7 kph). The 1-hour average wind gusts reach a maximum during September at 63.3 mph (101.9 kph) (NOAA 2018). The data provided in Table B.1-3 represent wind speed data at the National Data Buoy Center buoy station #44009, located southeast of Cape May, New Jersey, the southern end of the NY Bight region.

Table B.1-3. Wind speed data for southeast of Cape May, New Jersey (buoy #44009)

Month	Monthly Average Wind Speed		Monthly Average of Hourly Peak Gust		Monthly Maximum Hourly Peak Gust	
	mph	kph	mph	kph	mph	kph
January	17.4	28.0	24.1	38.7	61.6	99.1
February	16.2	26.1	21.9	35.2	56.8	91.5
March	15.5	25.0	20.5	33.0	57.5	92.6
April	14.0	22.6	19.0	30.6	56.8	91.5
May	12.7	20.4	16.2	26.1	60.2	96.9
June	11.5	18.5	15.3	24.6	47.6	76.7
July	10.9	17.6	14.7	23.7	50.1	80.6
August	11.2	18.0	15.2	24.4	48.6	78.2
September	13.0	20.9	18.0	28.9	63.3	101.9
October	14.8	23.9	20.5	33.0	60.6	97.6
November	16.3	26.3	21.8	35.0	57.3	92.2
December	17.1	27.6	23.8	38.3	56.2	90.4
Annual	14.0	22.6	19.1	30.7	63.3	101.9

Source: NOAA 2018.

B.1.2.2 Air Temperature

NOAA's National Centers for Environmental Information, formerly the National Climatic Data Center, defines distinct climatological divisions to represent areas that are nearly climatically homogeneous. Locations within the same climatic division are considered to share the same overall climatic features and influences. The NY Bight region spans the New York coastal division or New York Climate Division 4, and the New Jersey coastal division or New Jersey Climate Division 3 (NOAA National Centers for Environmental Information 2021a).

The mean average annual air temperature in the coastal division of New York was 51.4°F (10.8°C) between 1895 and 2021 (NOAA National Centers for Environmental Information 2021b). The seasonal mean ranged from 31.9°F (-0.1°C) in winter (December through February) to 70.8°F (21.6°C) in summer (June through August) (NOAA National Centers for Environmental Information 2021b).

A summary of monthly and annual mean temperature data collected for the New York coastal division between 1895 and 2021 is presented in Table B.1-4. This data is representative of the ambient air temperatures in the northern portion of the NY Bight lease areas.

Table B.1-4. Mean temperatures for New York coastal division, 1895 to 2021

Month	Average Mean Temperature		Maximum Mean Temperature		Minimum Mean Temperature	
	°F	°C	°F	°C	°F	°C
January	30.3	-0.9	38.0	3.3	22.6	-5.2
February	30.8	-0.7	38.7	3.7	22.8	-5.1
March	38.4	3.6	46.6	8.1	30.1	-1.1
April	47.9	8.8	57.0	13.9	38.8	3.8
May	58.1	14.5	67.6	19.8	48.7	9.3
June	67.4	19.7	76.6	24.8	58.2	14.6
July	73.1	22.8	81.9	27.7	64.3	17.9
August	71.8	22.1	80.3	26.8	63.2	17.3
September	65.3	18.5	74.2	23.4	56.4	13.6
October	54.8	12.7	63.8	17.7	45.7	7.6
November	44.4	6.9	52.4	11.3	36.3	2.4
December	34.6	1.4	42.0	5.6	27.1	-2.7
Annual	**51.4**	**10.8**	**59.9**	**15.5**	**42.9**	**6.0**

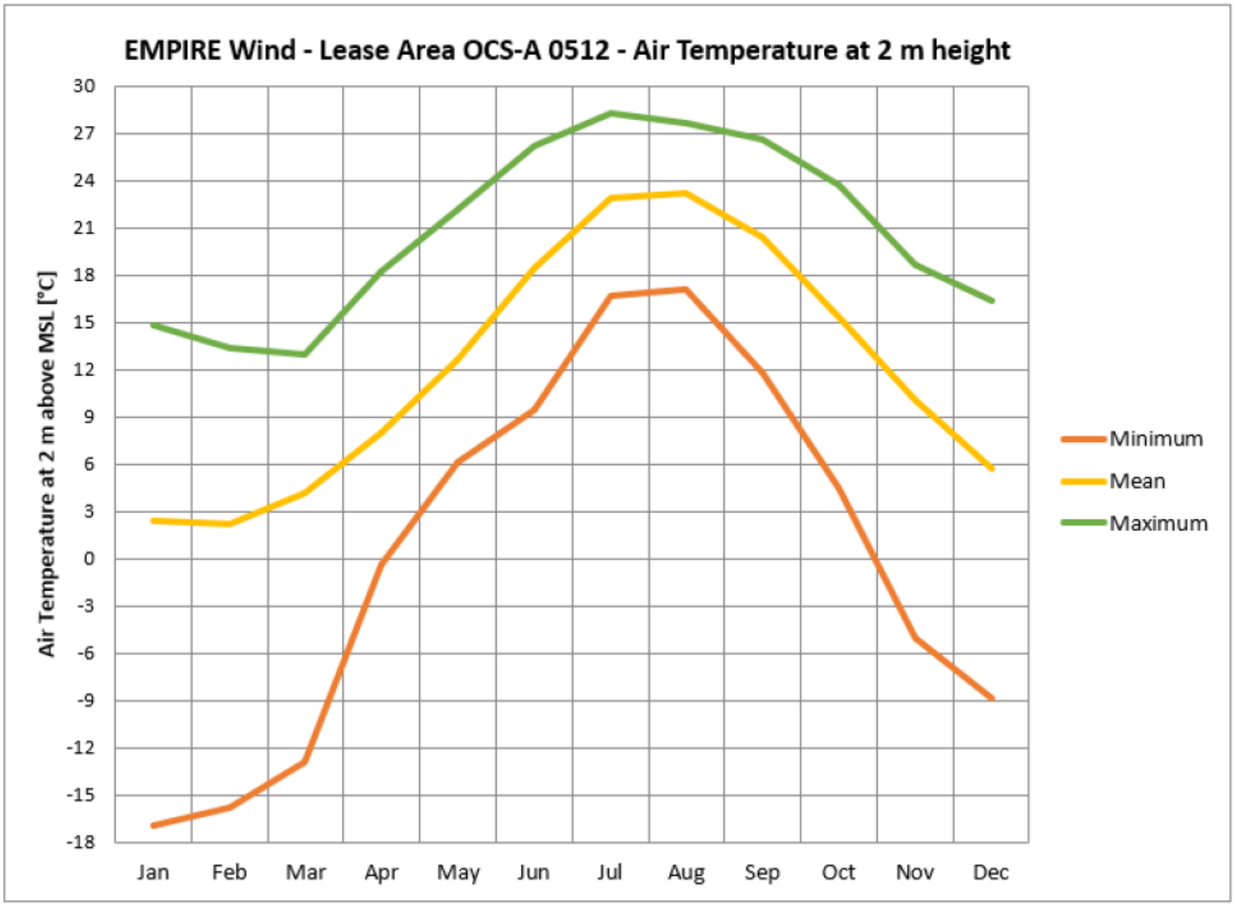
Source: NOAA National Centers for Environmental Information 2021b.

Representative air temperature information for the northern portion of the NY Bight lease areas is also available from NOAA's National Data Buoy Center Long Island buoy (Buoy No. 44025) and New York Harbor Entrance buoy (Buoy No. 44065). This information is presented in Table B.1-5 and shows air temperatures ranging from 35°F to 75°F (1.67°C to 23.90°C), with the higher temperatures during the summer months (Empire 2022b, 2022c). Minimum, mean, and maximum air temperatures occurring over the region at 6.6 feet (2 meters) AMSL from the period between 2002 and 2019 are shown graphically on Figure B.1-3.

Table B.1-5. Average air temperature at NOAA buoys in the Empire Wind study area

Month	Average Air Temperature in °F (°C)	
	Buoy No. 44065 (2008–2018)	Buoy No. 44025 (2007–2018)
January	35.01 (1.67)	37.98 (3.32)
February	36.66 (2.59)	38.70 (3.72)
March	39.58 (4.21)	41.49 (5.27)
April	46.65 (8.14)	47.03 (8.35)
May	56.71 (13.73)	55.33 (12.96)
June	66.04 (18.91)	65.46 (18.59)
July	73.92 (23.29)	73.29 (22.94)
August	75.02 (23.90)	73.98 (23.32)
September	69.69 (20.94)	68.61 (20.34)
October	59.94 (15.52)	60.53 (15.85)
November	49.10 (9.50)	51.06 (10.59)
December	42.13 (5.63)	43.77 (6.54)

Sources: Empire 2022b; Empire 2022c.



Source: Empire 2022a.

Figure B.1-3. Minimum, mean, and maximum air temperature at 6.6 feet (2 meters) AMSL at Lease Area OCS-A 0512

Ambient air temperature data at locations representative of the southern portion of the NY Bight lease areas are generally moderate and similar to those collected at the northern portion of the NY Bight lease areas. The mean average annual air temperature in the coastal division of New Jersey was 53.1°F (11.8°C) between 1895 and 2021 (NOAA National Centers for Environmental Information 2021b). Air temperature data collected from the Office of the New Jersey State Climatologist, Rutgers University, which averaged the annual, seasonal, and monthly means in southern and coastal areas of New Jersey for 1985–2009, similarly indicate that the annual mean air temperature was 53.2°F (11.8°C) (NJDEP 2010). The mean seasonal air temperature between 1985 and 2010 during the winter ranged from approximately 32–43°F (0–6°C) and in the spring from 54–64°F (12–18°C). The mean seasonal air temperature during the summer ranged from approximately 68–75°F (20–24°C) and during the fall from 53–65°F (12–18°C). The lowest average air temperatures occur in January and the highest in July (NJDEP 2010; NCDC 2021a). Recent offshore air temperature data were downloaded from NOAA buoys near the NY Bight lease areas. Data between 2014 and 2018 were downloaded from Atlantic City, New Jersey (Buoy No. ACYN4), which is located near the southern portion of the NY Bight lease areas. Table B.1-6 summarizes average temperatures at the Atlantic City buoy.

Table B.1-6. Representative temperature data for the Ocean Wind 1 project area

NOAA Station	Year	Annual Average °F/°C	No. of Observations
Atlantic City Buoy (No. ACYN4)	2014	53.8/12.1	86,432
	2015	55.4/13.0	86,357
	2016	55.6/13.1	81,252
	2017	55.9/13.3	85,557
	2018	52.9/11.6	63,856

Source: Ocean Wind 2022.

Given the cold air temperatures experienced during many Mid-Atlantic winters, there is potential for icing of equipment and vessels above the water line in the NY Bight area. Cook and Chatterton (2008) analyzed icing events in Delaware Bay for winters from 1997 to 2007 and found that icing events are a common occurrence during January, February, and March. The worst winter, as far as icing is concerned, experienced by the Delaware Bay region from 1997 through 2007, was in 2002/2003, during which 21 icing events occurred. Delaware Bay experiences approximately eight events annually where the variables favoring icing are consistent for 3 or more hours.

In addition, the occurrence of fog in the Mid-Atlantic states is driven by regional-scale weather patterns and local topographic and surface conditions. The interaction between various weather systems and the physical state of the local conditions is complex. Ward and Croft (2008) found that high-pressure systems result in heavy fog over the Delaware Bay and nearby Atlantic coastal areas. During the 2006/2007 winter season (December–February), Delaware Coastal Airport (Georgetown, Delaware) reported 45 fog events, 4 of which were described as dense fog (Ward and Croft 2008).

B.1.2.3 Precipitation

In the northern portion of the NY Bight lease areas, precipitation in the New York coastal region primarily takes the form of rain and snow. The mean annual precipitation for the coastal region of New York between 1895 and 2021 was 44.89 inches (114.0 centimeters) (NOAA National Centers for Environmental Information 2021c). During the same period, the mean monthly precipitation ranged from 3.40 inches (8.6 centimeters) in February to 4.19 inches (10.6 centimeters) in March (NOAA National Centers for Environmental Information 2021c). A summary of monthly and annual mean precipitation data collected for the New York coastal division between 1895 and 2021 is presented in Table B.1-7.

Table B.1-7. Mean precipitation for New York coastal division, 1895 to 2021

	Total Mean Precipitation	
Month	Inches	Centimeters
January	3.6	9.1
February	3.4	8.6
March	4.2	10.7
April	3.9	9.9
May	3.8	9.7
June	3.5	8.9
July	3.7	9.4

Month	Total Mean Precipitation	
	Inches	Centimeters
August	4.1	10.4
September	3.6	9.1
October	3.6	9.1
November	3.8	9.7
December	4.0	10.2
Annual	**44.9**	**114.0**

Source: NOAA National Centers for Environmental Information 2021c.

Similarly, in the southern portion of the NY Bight lease areas, precipitation in the New Jersey coastal region primarily takes the form of rain and snow (NJDEP 2010). Average monthly precipitation data from the National Climatic Data Center are presented in Table B.1-8.

Table B.1-8. Mean precipitation in the New Jersey coastal division[1]

Month	Precipitation (inches/centimeters)	
	Atlantic City Marina, New Jersey	Brant Beach, Beach Haven, New Jersey
January	3.08/7.82	3.25/8.26
February	2.87/7.29	2.86/7.26
March	4.02/10.21	3.97/10.08
April	3.39/8.61	3.26/8.28
May	3.22/8.18	2.78/7.06
June	2.68/6.81	3.05/7.75
July	3.31/8.41	3.92/9.96
August	3.92/9.96	3.71/9.42
September	3.08/7.82	2.78/7.06
October	3.47/8.81	3.65/9.27
November	3.35/8.51	2.91/7.39
December	3.62/9.19	3.36/8.53
Annual Average	**3.33/8.47**	**3.29/8.36**

Sources: NCDC 2021a, 2021b.

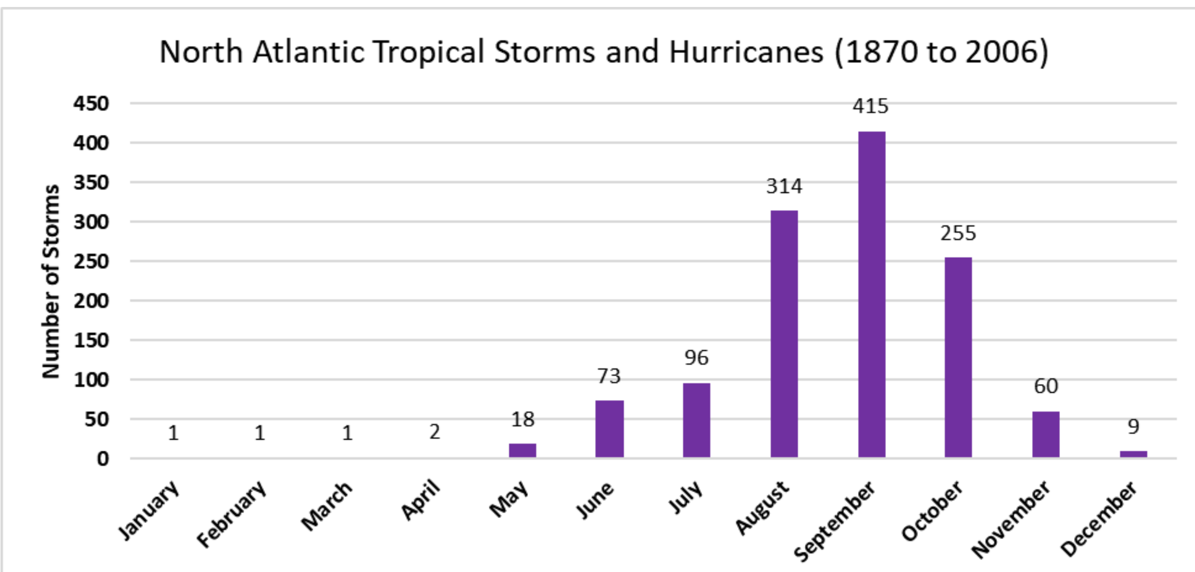
[1] Precipitation is recorded in melted inches (snow and ice are melted to determine monthly equivalent).

Snowfall amounts can vary quite drastically within small distances. Data from Lewes, Delaware, approximately 60 miles southwest of Atlantic City, New Jersey, show that the annual snowfall average is approximately 12 inches (30.5 centimeters), and the month with the highest snowfall is January, averaging around 4 inches (10.2 centimeters) (WRCC 2022).

B.1.2.4 Extreme Storm Events

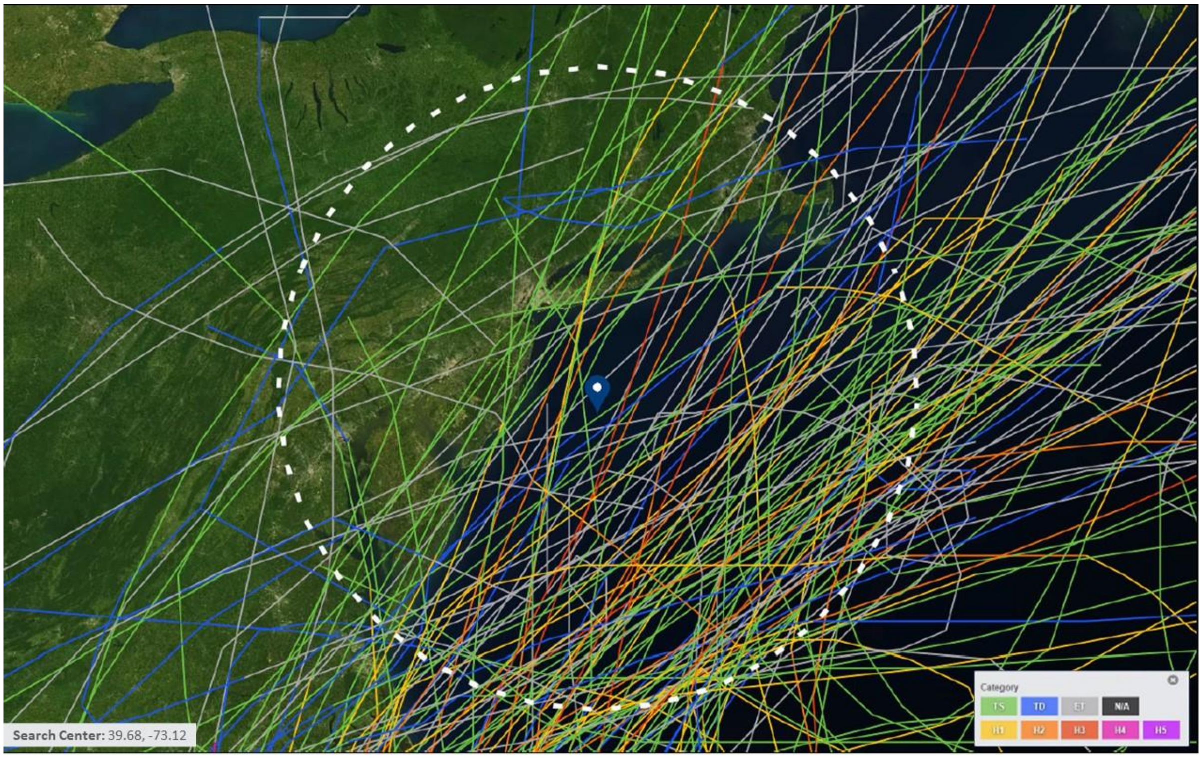
Strong weather events in the NY Bight area include, but are not limited to, hurricanes and tropical storms in the warmer months and nor’easters during the winter months. The number of tropical storms, including hurricanes, generally reaches a peak during the period from August to early October at the northern end of the NY Bight area (Empire 2022a). This is consistent with the peak period for tropical cyclones throughout the North Atlantic basin (Figure B.1-4) (McAdie et al. 2009). Most hurricane events within the Atlantic generally occur from mid-August to late October, with the majority of all events occurring in September (Donnelly et al. 2004). At the southern end of the NY Bight area along the New Jersey coast, hurricanes occur every 3 to 4 years within 90 to 170 miles of the coast, on average (NJDEP 2010). Such storms that travel along the coastline of the eastern United States have the potential to affect the NY Bight lease areas and adjacent coastal communities with high winds and severe flooding.

Figure B.1-5 identifies the hurricane tracks surrounding the NY Bight area between 1950 and 2019 (NOAA 2021c). The category for each storm is designated by a color for each segment of its track on Figure B.1-5. Table B.1-9 lists each of the hurricanes affecting the NY Bight area and the corresponding maximum storm categories while the hurricane was within approximately 200 nautical miles (370 kilometers) of the NY Bight lease areas for the corresponding period (NOAA 2021c). The 200-nautical mile (370-kilometer) radius circle was centered upon the approximate center point of the NY Bight lease areas within Lease Area OCS-A-0538, located at latitude 39.68, longitude -73.12. Most historical hurricanes affecting the NY Bight area are Category 1, but storms as powerful as Category 5 hurricanes have passed nearby the NY Bight lease areas. The New York State ClimAID assessment determined that intense hurricanes are likely to increase in frequency over the 21st century for New York City and Long Island (New York State Climate Action Council 2010).



Source: McAdie et al. 2009.

Figure B.1-4. Total number of North Atlantic basin tropical storms and hurricanes by month from 1870 to 2006



Source: NOAA 2021c.
Note: TS = Tropical Storm; TD = Tropical Depression; ET = Extratropical Storm; N/A = None Applied; H1 = Category 1; H2 = Category 2; H3 = Category 3; H4 = Category 4; H5 = Category 5.

Figure B.1-5. Tracks of hurricanes, tropical storms, tropical depressions, and extratropical storms between 1950 and 2019 within a 200-nautical mile (370-kilometer) radius around Lease Area OCS-A-0538

Table B.1-9. Hurricanes with tracks passing within 200 nautical miles (370 kilometers) of the NY Bight lease areas between 1950 and 2021

Storm Name	Year	Maximum Storm Category	Storm Name	Year	Maximum Storm Category
Ida	2021	Category 4 Hurricane	Bob	1991	Category 3 Hurricane
Henri	2021	Category 1 Hurricane	Lili	1990	Category 1 Hurricane
Elsa	2021	Category 1 Hurricane	Charley	1986	Category 1 Hurricane
Zeta	2020	Category 3 Hurricane	Gloria	1985	Category 4 Hurricane
Isaias	2020	Category 1 Hurricane	Danny	1985	Category 1 Hurricane
Dorian	2019	Category 5 Hurricane	Josephine	1984	Category 2 Hurricane
Michael	2018	Category 5 Hurricane	Diana	1984	Category 4 Hurricane
Florence	2018	Category 4 Hurricane	Dennis	1981	Category 1 Hurricane
Maria	2017	Category 5 Hurricane	David	1979	Category 5 Hurricane
Jose	2017	Category 4 Hurricane	Belle	1976	Category 3 Hurricane
Hermine	2016	Category 1 Hurricane	Dawn	1972	Category 1 Hurricane
Arthur	2014	Category 2 Hurricane	Agnes	1972	Category 1 Hurricane
Sandy	2012	Category 3 Hurricane	Ginger	1971	Category 2 Hurricane
Irene	2011	Category 3 Hurricane	Unnamed	1970	Category 1 Hurricane
Earl	2010	Category 4 Hurricane	Gerda	1969	Category 3 Hurricane
Hanna	2008	Category 1 Hurricane	Gladys	1968	Category 2 Hurricane

Storm Name	Year	Maximum Storm Category	Storm Name	Year	Maximum Storm Category
Noel	2007	Category 1 Hurricane	Doria	1967	Category 2 Hurricane
Ernesto	2006	Category 1 Hurricane	Alma	1966	Category 3 Hurricane
Ophelia	2005	Category 1 Hurricane	Gladys	1964	Category 4 Hurricane
Cindy	2005	Category 1 Hurricane	Dora	1964	Category 4 Hurricane
Jeanne	2004	Category 3 Hurricane	Alma	1962	Category 1 Hurricane
Ivan	2004	Category 5 Hurricane	Esther	1961	Category 5 Hurricane
Gaston	2004	Category 1 Hurricane	Donna	1960	Category 4 Hurricane
Charley	2004	Category 4 Hurricane	Gracie	1959	Category 4 Hurricane
Alex	2004	Category 3 Hurricane	Cindy	1959	Category 1 Hurricane
Kyle	2002	Category 1 Hurricane	Daisy	1958	Category 4 Hurricane
Gustav	2002	Category 2 Hurricane	Flossy	1956	Category 1 Hurricane
Gordon	2000	Category 1 Hurricane	Ione	1955	Category 4 Hurricane
Irene	1999	Category 2 Hurricane	Diane	1955	Category 2 Hurricane
Floyd	1999	Category 4 Hurricane	Connie	1955	Category 4 Hurricane
Dennis	1999	Category 2 Hurricane	Hazel	1954	Category 4 Hurricane
Earl	1998	Category 2 Hurricane	Edna	1954	Category 3 Hurricane
Bonnie	1998	Category 3 Hurricane	Carol	1954	Category 3 Hurricane
Danny	1997	Category 1 Hurricane	Carol	1953	Category 5 Hurricane
Edouard	1996	Category 4 Hurricane	Barbara	1953	Category 1 Hurricane
Bertha	1996	Category 3 Hurricane	Able	1952	Category 2 Hurricane
Felix	1995	Category 4 Hurricane	How	1951	Category 2 Hurricane
Allison	1995	Category 1 Hurricane	Able	1951	Category 1 Hurricane
Emily	1993	Category 3 Hurricane	Dog	1950	Category 4 Hurricane
Unnamed	1991	Category 1 Hurricane	Able	1950	Category 3 Hurricane

Source: NOAA 2021c.
Notes: The NY Bight lease areas were represented by a point with the following coordinates: latitude 39.68, longitude -73.12. Hurricane categories are identified as 1 through 5 based on the Saffir-Simpson scale.

Hurricane Sandy, which occurred in 2012, provides an example of extreme storm conditions that have occurred in the region. In coastal New Jersey, Hurricane Sandy caused the highest storm surges and greatest inundation on land. The storm surge and large waves from the Atlantic Ocean meeting up with rising waters from back bays such as Barnegat Bay and Little Egg Harbor caused barrier islands to be completely inundated (Blake et al. 2013). In Atlantic City and Cape May, tide gauges measured storm surges of 5.8 and 5.2 feet (1.8 and 1.6 meters), respectively (Blake et al. 2013). Marine observations at the Cape May National Ocean Service (CMAN4) recorded sustained wind speeds at 52 knots (60 mph; 27 m/s) and an estimated inundation of 3.5 feet (1.1 meters) (Blake et al. 2013).

In coastal New York, the storm surge created by Hurricane Sandy was more severe than a 100-year extreme event (Empire 2022). In Bergen Point West Reach on the northern side of Staten Island, tide gauges measured a storm surge of 9.56 feet (2.91 meters) and estimated inundation of 9.53 feet (2.9 meters). At the Battery on the southern tip of Manhattan, tide gauges measured storm surges of 9.40 feet (2.87 meters) and estimated inundation of 9.00 feet (2.7 meters) (Blake et al. 2013). Marine observations at NOAA Buoy No. 44025 and NOAA Buoy No. 44065 recorded maximum sustained wind speeds of 49 knots (56.4 mph; 25.2 m/s) and 48 knots (55.2 mph; 24.7 m/s), respectively (Blake et al. 2013).

B.1.3 Projected Future Climate

Projected future climate conditions include changes to the above metocean characteristics as well as other climate characteristics, including ocean warming, ocean acidification, and sea level rise. Uncertainty in the magnitude of such climate changes exists due to the uncertainty of future GHG emissions rates—which are directly related to the rate of climate change—and the inherent uncertainty of climate modeling methods. Future climate change projections are categorized by GHG emissions scenarios ranging from low global GHG emissions scenarios to high global GHG emissions scenarios. Low global GHG emissions scenarios imply less change to climate conditions, while high global GHG scenarios imply greater change to climate conditions. The subsections below describe the expected changes to climate conditions in the NY Bight area under the U.S. Environmental Protection Agency (USEPA) (2017) lower (Representation Concentration Pathways [RCP] 4.5) and higher (RCP 8.5) GHG emissions scenarios, unless noted otherwise.[2] Future projected changes to wind conditions in the NY Bight area are not included, as such changes are not explicitly characterized by available studies.

B.1.3.1 Air Temperature

In the Northeast United States between 1940 and 2014, the average winter-spring air temperature has risen 1.67°F (increase of 0.93°C) (Dupigny-Giroux et al. 2018). By 2035, under both lower and higher GHG emissions scenarios, the Northeast region is expected to be 3.6°F (2°C) warmer on average than during the pre-industrial era (Dupigny-Giroux et al. 2018). This would be the largest increase in the contiguous United States and would occur as much as two decades before global average temperatures reach a similar milestone (Dupigny-Giroux et al. 2018). By 2050, in New Jersey, temperatures are expected to increase by 4.1 to 5.7°F (2.3 to 3.2°C) based on the lower and higher GHG emissions scenarios, respectively (NJDEP 2020; Horton et al. 2015). Similarly, in New York State, under the lower and higher GHG emissions scenarios, average annual temperatures are projected to increase by 2.0 to 3.4°F by the 2020s, 4.1 to 6.8°F by the 2050s, and 5.3 to 10.1°F by the 2080s (Horton et al. 2014). According to the New York State Department of Conservation, the annual statewide average temperature in New York has warmed 3°F (1.7°C) since 1970 (NYSDEC 2023).

B.1.3.2 Precipitation

The recent dominant trend in precipitation throughout the Northeast United States has been toward increases in rainfall intensity, with recent increases in intensity exceeding those in other regions in the contiguous United States (Dupigny-Giroux et al. 2018). The Northeast region has seen a 55 percent increase in the number of heaviest 1 percent precipitation events between 1958 and 2016 (Dupigny-Giroux et al. 2018). Severe storms have become more frequent and more intense. Further increases in rainfall intensity are expected, with increases in precipitation expected during the winter and spring with little change in the summer (Dupigny-Giroux et al. 2018). The proportion of winter precipitation falling as rain has already increased and will likely continue to do so in response to a northward shift in

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[2] The RCPs are identified by their approximate total radiative forcing (not emissions) in the year 2100, relative to 1750: 2.6 watts per meter squared (RCP 2.6), 4.5 watts per meter squared (RCP 4.5), and 8.5 watts per meter squared (RCP 8.5) (USEPA 2017).

the snow-rain transition zone projected under both lower and higher climate change scenarios (Dupigny-Giroux et al. 2018). The northward shifts are about 2° latitude under the lower emissions scenario and 4° latitude under the higher emissions scenario (Ning and Bradley 2015). By 2100, in New Jersey, heavy precipitation events are projected to occur two to five times more often and with more intensity than the 20th century under a low emissions scenario (RCP 2.6) versus the higher emissions scenario (RCP 8.5) (Walsh et al. 2014; NJDEP 2020). Small decreases in the amount of precipitation may occur in New Jersey in the summer months, resulting in greater potential for more frequent and prolonged droughts (NJDEP 2020). Regional precipitation across New York State is projected to increase by approximately 1 to 8 percent by the 2020s, 3 to 12 percent by the 2050s, and 4 to 15 percent by the 2080s under the lower and higher emissions scenarios (Horton et al. 2014).

B.1.3.3 Extreme Storm Events

Storm flood heights driven by hurricanes in New York City have increased by more than 3.9 feet (1.2 meters) over the last thousand years (Dupigny-Giroux et al. 2018). Due to predicted increases in average global temperatures, the frequency and intensity of extreme regional weather events such as heat waves, strong winds, and heavy precipitation are expected to increase in the coming decades (New York State Climate Action Council 2010; Dupigny-Giroux et al. 2018). The strongest hurricanes are anticipated to become both more frequent and more intense in the future, with greater amounts of precipitation (Dupigny-Giroux et al. 2018). More than 80 percent of open-coast north and Mid-Atlantic beaches are predicted to overwash during a Category 4 hurricane (Dupigny-Giroux et al. 2018). Additionally, 32 percent of open-coast north and Mid-Atlantic beaches are predicted to overwash during an intense future nor'easter type storm (Dupigny-Giroux et al. 2018).

B.1.3.4 Ocean Warming

Ocean and coastal temperatures along the Northeast United States Continental Shelf have increased by 0.06°F (0.033°C) per year from 1982 to 2016, which is three times faster than the global average rate of 0.018°F (0.01°C) per year (Dupigny-Giroux et al. 2018). From 2007 to 2016, the regional warming rate was four times faster than the trend from 1982 to 2016 at a warming rate of 0.25°F (0.14°C) per year (Dupigny-Giroux et al. 2018). Climate projections indicate that in the future the ocean over the Northeast United States Continental Shelf will experience more warming than most other ocean regions around the world (Dupigny-Giroux et al. 2018).

B.1.3.5 Ocean Acidification

Coastal waters in the Northeast United States region are sensitive to the effects of ocean acidification because they have low capacity for maintaining stable pH levels (Dupigny-Giroux et al. 2018). These waters are particularly vulnerable to acidification due to hypoxia (low-oxygen conditions) induced by eutrophication, and freshwater inputs, which are expected to increase as climate change progresses (Dupigny-Giroux et al. 2018). Since the industrial age, pH levels have declined by 0.1 pH units, from a global average of 8.2 to 8.1, which represents a 30 percent increase in acidity due to the logarithmic scale in which pH is measured (NJDEP 2020). If GHG emissions continue at current rates, ocean pH levels are expected to fall another 0.3 to 0.4 pH units by the end of the century, representing another 120 percent increase in acidity and creating an ocean that is more acidic than has been seen for the past 20 million years (NJDEP 2020).

Fisheries and aquaculture rely on shell-forming organisms that can suffer in more acidic conditions (Dupigny-Giroux et al. 2018). Many coastal communities in the Northeast United States region also have strong social and cultural ties to marine fisheries; in some communities, fisheries represent an important economic activity as well (Dupigny-Giroux et al. 2018). Future ocean warming and acidification, which are expected under all scenarios considered, would affect fish stocks and fishing opportunities available to coastal communities (Dupigny-Giroux et al. 2018).

B.1.3.6 Sea Level Rise

Along the Mid-Atlantic coast (from Cape Hatteras, North Carolina to Cape Cod, Massachusetts), several decades of tide gauge data through 2009 have shown that sea level rise rates were three to four times higher than the global average rate (Dupigny-Giroux et al. 2018). The region's sea level rise rates are increased by land subsidence, changes in the Gulf Stream, and geologic influences related to the loss of the North American ice sheet, all of which contribute to a higher sea level relative to land elevation (Dupigny-Giroux et al. 2018; NJDEP 2020). Projections for the Northeast United States region suggest that sea level rise will be greater than the global average of approximately 0.12 inches (3 millimeters) per year (Dupigny-Giroux et al. 2018). Two probable sea level rise scenarios project sea level rise of 2 and 4.5 feet (0.6 and 1.4 meters) on average in the region by 2100 (Dupigny-Giroux et al. 2018). By 2050, New Jersey will likely experience at least a 0.9- to 2.1-foot increase (above the levels in 2000), 1.4- to 3.1-foot increase by 2070, and potentially a 2.0- to 5.1-foot increase by 2100 (NJDEP 2020). Increases in sea level will exacerbate flooding in the coastal area caused by more intense rain events and storms (NJDEP 2020). In addition, low-lying coastal areas in New Jersey are already experiencing tidal flooding, even on sunny days in the absence of precipitation events (NJDEP 2020). Along the New York State coastline, sea level is projected to rise by 3 to 8 inches by the 2020s, 9 to 21 inches by the 2050s, and 14 to 39 inches by the 2080s (Horton et al. 2014). According to the New York State Department of Conservation, sea levels along New York's coast and in the Hudson River have already risen more than a foot since the year 1900 (about 1.2 inches per decade) (NYSDEC 2023).

B.1.4 Potential General Impacts of Offshore Wind Facilities on Meteorological Conditions

A known impact of offshore wind facilities on meteorological conditions is the "wake effect" (Christiansen and Hasager 2005). A WTG extracts energy from the free flow of wind, creating turbulence downstream of the WTG. The resulting wake effect is the aggregated influence of the WTGs for the entire wind farm on the available wind resource and the energy production potential of any facility downstream. Christiansen and Hasager (2005) observed offshore wake effects from existing facilities via satellite with synthetic aperture radar to last anywhere from 1.2 to 12.4 miles (2 to 20 kilometers) depending on ambient wind speed, direction, degree of atmospheric stability, and the number of turbines within a facility. During stable atmospheric conditions, these offshore wakes can be longer than 43.5 miles (70 kilometers).

Under certain conditions, offshore wind farms can also affect temperature and moisture downwind of the facilities. For example, from September 2016 to October 2017, a study using aircraft observations accompanied by mesoscale simulations examined the spatial dimensions of micrometeorological impacts from a wind energy facility in the North Sea (Siedersleben et al. 2018). Measurements and associated modeling indicated that measurable redistribution of moisture and heat were possible up to 62 miles (100 kilometers) downwind of the wind farm. However, this occurred only when (1) there was a strong, sustained temperature inversion at or below hub height and (2) wind speeds were greater than approximately 13.4 mph (6 m/s) (Siedersleben et al. 2018). Typically, air temperature will decrease with height above the sea surface in the lower atmosphere (i.e., the troposphere), and air will freely rise and disperse up to a "mixing height" (Holzworth 1972; Ramaswamy et al. 2006). A temperature inversion occurs when a warmer overlying air mass causes temperatures to increase with height; a strong inversion inhibits the further rise of cooler surface air masses, thus limiting the mixing height (Ramaswamy et al. 2006). Therefore, the North Sea study suggests that rapidly spinning turbines with hub heights at or above a strong inversion may induce mixing between air masses that would otherwise remain separated, which can significantly affect temperature and humidity downwind of a wind farm.

The mixing height over open waters of the North Atlantic Ocean is typically greater than 1,640 feet (500 meters) AMSL, except over areas of upwelling, where the mixing height may be closer to the sea surface (Holzworth 1972; Fuhlbrügge et al. 2013). Table B.1-10 presents atmospheric mixing height data from the nearest measurement location to the NY Bight area (Atlantic City, New Jersey). As shown in the table, the minimum average mixing height is 1,279 feet (390 meters), while the maximum average mixing height is 3,996 feet (1,218 meters).

Table B.1-10. Representative seasonal mixing height data

Season	Data Hours Included[1]	Atlantic City, New Jersey Average Mixing Height (feet/meters)
Winter (December, January, February)	Morning: No-Precipitation Hours	2,047/624
	Morning: All Hours	2,024/617
	Afternoon: No-Precipitation Hours	2,539/774
	Afternoon: All Hours	1,280/390
Spring (March, April, May)	Morning: No-Precipitation Hours	1,788/545
	Morning: All Hours	2,100/640
	Afternoon: No-Precipitation Hours	3,924/1,196
	Afternoon: All Hours	1,637/499
Summer (June, July, August)	Morning: No-Precipitation Hours	1,677/511
	Morning: All Hours	1,857/566
	Afternoon: No-Precipitation Hours	3,996/1,218
	Afternoon: All Hours	2,280/695
Fall (September, October, November)	Morning: No-Precipitation Hours	1,588/484
	Morning: All Hours	2,129/649
	Afternoon: No-Precipitation Hours	3,241/988

Season	Data Hours Included[1]	Atlantic City, New Jersey Average Mixing Height (feet/meters)
	Afternoon: All Hours	1,562/476
Annual Average	Morning: No-Precipitation Hours	1,768/539
	Morning: All Hours	2,034/620
	Afternoon: No-Precipitation Hours	3,451/1,052
	Afternoon: All Hours	1,667/508

Source: USEPA 2021.
[1] Missing values are not included.

Díaz et al. (2019) reported that measurements over the Atlantic Ocean between 1981 and 2010 indicated a trend of decreasing strength and thickness of inversion layers, accompanied by a general increase in the mixing height, which is correlated with an increase in sea surface temperatures. Therefore, WTG hub heights are expected to remain well below the typical mixing height and associated temperature inversions over the open ocean in the Mid-Atlantic region. As such, the redistribution of moisture and heat due to rotor-induced vertical mixing, and any associated shifts to the microclimate, would be limited to the immediate vicinity of a wind facility in this region.

Additionally, mixing height affects air quality by acting as a lid on the height to which air pollutants can vertically disperse. Lower mixing heights allow less air volume for pollutant dispersion and lead to higher ground-level pollutant concentrations than do higher mixing heights.

B.1.5 Air Quality Standards

Air quality is measured in comparison to the NAAQS, which are standards established by the USEPA pursuant to the Clean Air Act (42 USC 7409) for several common air pollutants, known as criteria pollutants, to protect human health and welfare. Primary standards are set at levels to protect human health with a margin of safety. Secondary standards are set at levels to protect public welfare including plants, animals, ecosystems, and materials. The criteria pollutants are CO, lead, NO_2, O_3, PM_{10}, $PM_{2.5}$, and SO_2. New Jersey and New York have established ambient air quality standards that are similar to the NAAQS. Table B.1-11 shows the NAAQS as well as the state ambient air quality standards for New Jersey and New York for the criteria pollutants.

Table B.1-11. National and state ambient air quality standards

Pollutant	Averaging Period	National Ambient Air Quality Standards (µg/m³)		New Jersey Ambient Air Quality Standards (µg/m³)		New York Ambient Air Quality Standards (µg/m³)	
		Primary	Secondary	Primary	Secondary	Primary	Secondary
Carbon Monoxide (CO)	8-hour[1]	10,000	None	10,000	10,000	None	None
	1-hour[1]	40,000	None	40,000	40,000	None	None
Lead (Pb)	Rolling 3-month average[2]	0.15	0.15	1.5	1.5	None	None
Nitrogen Dioxide	Annual[2]	100	100	100	100	None	None

Pollutant	Averaging Period	National Ambient Air Quality Standards (μg/m³)		New Jersey Ambient Air Quality Standards (μg/m³)		New York Ambient Air Quality Standards (μg/m³)	
		Primary	Secondary	Primary	Secondary	Primary	Secondary
(NO_2)	1-hour[3]	188	None	None	None	None	None
Ozone (O_3)	8-hour[4]	137 (70 ppb)	137 (70 ppb)	None	None	None	None
	1-hour[1]	None	None	235	160	None	None
Particulate Matter (PM_{10})	24-hour[5]	150	150	None	None	None	None
Particulate Matter ($PM_{2.5}$)	Annual[6]	12	15	None	None	None	None
	24-hour[7]	35	35	None	None	None	None
Sulfur Dioxide (SO_2)	Annual[2]	80	None	80	60	80	80
	24-hour[1]	None	None	365	260	365	365
	3-hour[1]	None	1,300	None	1,300	1,300	1,300
	1-hour[8]	196	None	None	None	None	None

Source: 40 CFR 50; NJDEP 1991; NYSDEC 2022.
[1] Not to be exceeded more than once per year.
[2] Not to be exceeded.
[3] 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
[4] Annual 4th-highest daily maximum 8-hour concentration, averaged over 3 years.
[5] Not to be exceeded more than once per year on average over 3 years.
[6] Annual mean, averaged over 3 years.
[7] 98th percentile, averaged over 3 years.
[8] 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
μg/m³ = micrograms of pollutant per cubic meter of air; ppb = parts per billion.

B.2 Birds

NYSERDA conducted aerial digital surveys for avian and marine wildlife between 2018 and 2019 in the NY Bight area (NYSERDA 2022). The aerial data provides coverage for all of four NY Bight lease areas (OCS-A 0537, OCS-A 0538, OCS-A 0539, and OCS-A 0544), a portion of OCS-A 0542, and none of OCS-A 0541. Table B.2-1 identifies the number of observations by species and by lease area, and Figure B.2-1 shows the geographic distribution of the observations.

Table B.2-1. NYSERDA aerial avian survey species observations

Species	OCS-A 0537		OCS-A 0538		OCS-A 0539		OCS-A 0542		OCS-A 0544		Total	Total %
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	
Auk-species unknown		0.0%		0.0%	1	0.7%		0.0%		0.0%	1	0.1%
Black-legged Kittiwake	37	9.5%	14	4.3%	7	4.8%	2	11.1%		0.0%	60	6.2%
Bonaparte's Gull		0.0%		0.0%	85	58.6%		0.0%	12	14.8%	97	10.1%
Comic/Forster's Tern		0.0%		0.0%	1	0.7%	1	5.6%		0.0%	2	0.2%
Common Loon	7	1.8%	21	6.4%	22	15.2%	2	11.1%	2	2.5%	54	5.6%
Dovekie		0.0%		0.0%		0.0%	3	16.7%		0.0%	3	0.3%
Great Black-backed Gull		0.0%	1	0.3%	1	0.7%	2	11.1%	10	12.3%	14	1.5%
Great Shearwater	9	2.3%		0.0%		0.0%		0.0%		0.0%	9	0.9%
Gull-species unknown – Large	1	0.3%		0.0%		0.0%		0.0%	1	1.2%	2	0.2%
Gull-species unknown – Small	8	2.1%	2	0.6%	9	6.2%		0.0%	27	33.3%	46	4.8%
Herring Gull	9	2.3%	6	1.8%	1	0.7%	1	5.6%	17	21.0%	34	3.5%
Loon-species unknown	1	0.3%		0.0%		0.0%		0.0%	1	1.2%	2	0.2%
Murre/Razorbill	5	1.3%	1	0.3%		0.0%		0.0%	2	2.5%	8	0.8%
Northern Fulmar	1	0.3%	1	0.3%		0.0%		0.0%		0.0%	2	0.2%
Northern Gannet	7	1.8%	3	0.9%	9	6.2%	5	27.8%	2	2.5%	26	2.7%
Red Phalarope	76	19.5%	273	83.2%	2	1.4%		0.0%	2	2.5%	353	36.7%
Red/Red-necked Phalarope	65	16.7%		0.0%		0.0%		0.0%		0.0%	65	6.8%
Red-necked Phalarope	4	1.0%		0.0%		0.0%		0.0%		0.0%	4	0.4%
Red-throated Loon	9	2.3%	2	0.6%	6	4.1%		0.0%	5	6.2%	22	2.3%
Shearwater-species unknown – Large	140	35.9%		0.0%		0.0%		0.0%		0.0%	140	14.6%
Shearwater-species unknown – Small		0.0%	1	0.3%		0.0%		0.0%		0.0%	1	0.1%
Sooty Shearwater		0.0%		0.0%	1	0.7%		0.0%		0.0%	1	0.1%
Storm-petrel-species unknown	11	2.8%	3	0.9%		0.0%	2	11.1%		0.0%	16	1.7%
Total	**390**	**100.0%**	**328**	**100.0%**	**145**	**100.0%**	**18**	**100.0%**	**81**	**100.0%**	**962**	**100.0%**

Source: NYSERDA 2022.

NYSERDA remote metocean data from one buoy (latitude 39.9692, longitude -72.7166) in NY Bight lease area OCS-A 0537 and one buoy (latitude 39.54677, longitude -73.4292) in NY Bight lease area OCS-A 0539 detected a total of 215 bird passes consisting of nine species between September 2019 and September 2022 (Normandeau Associates Inc. 2022). The bat and bird species and total count observations data collected by the NYSERDA remote metocean buoys are shown in Table B.2-2.

Table B.2-2. NYSERDA remote metocean buoy bat and bird species and total count observations

	OCS-A 0537		OCS-A 0539			
Species	**Count**	**%**	**Count**	**%**	**Total Count**	**Total %**
American Redstart	1	1.0%	2	1.6%	3	1.3%
Green Heron		0.0%	1	0.8%	1	0.4%
Herring Gull	82	85.4%	121	93.8%	203	90.2%
Least Bittern	2	2.1%		0.0%	2	0.9%
Palm Warbler	1	1.0%		0.0%	1	0.4%
Ring-billed Gull		0.0%	1	0.8%	1	0.4%
White-throated Sparrow	2	2.1%		0.0%	2	0.9%
Wood Thrush		0.0%	1	0.8%	1	0.4%
Yellow Warbler	1	1.0%		0.0%	1	0.4%
Silver-haired bat	6	6.3%	3	2.3%	9	4.0%
Unknown low frequency species	1	1.0%		0.0%	1	0.4%
Grand Total	**96**	**100.0%**	**129**	**100.0%**	**225**	**100.0%**

Source: Normandeau Associates Inc. 2022.

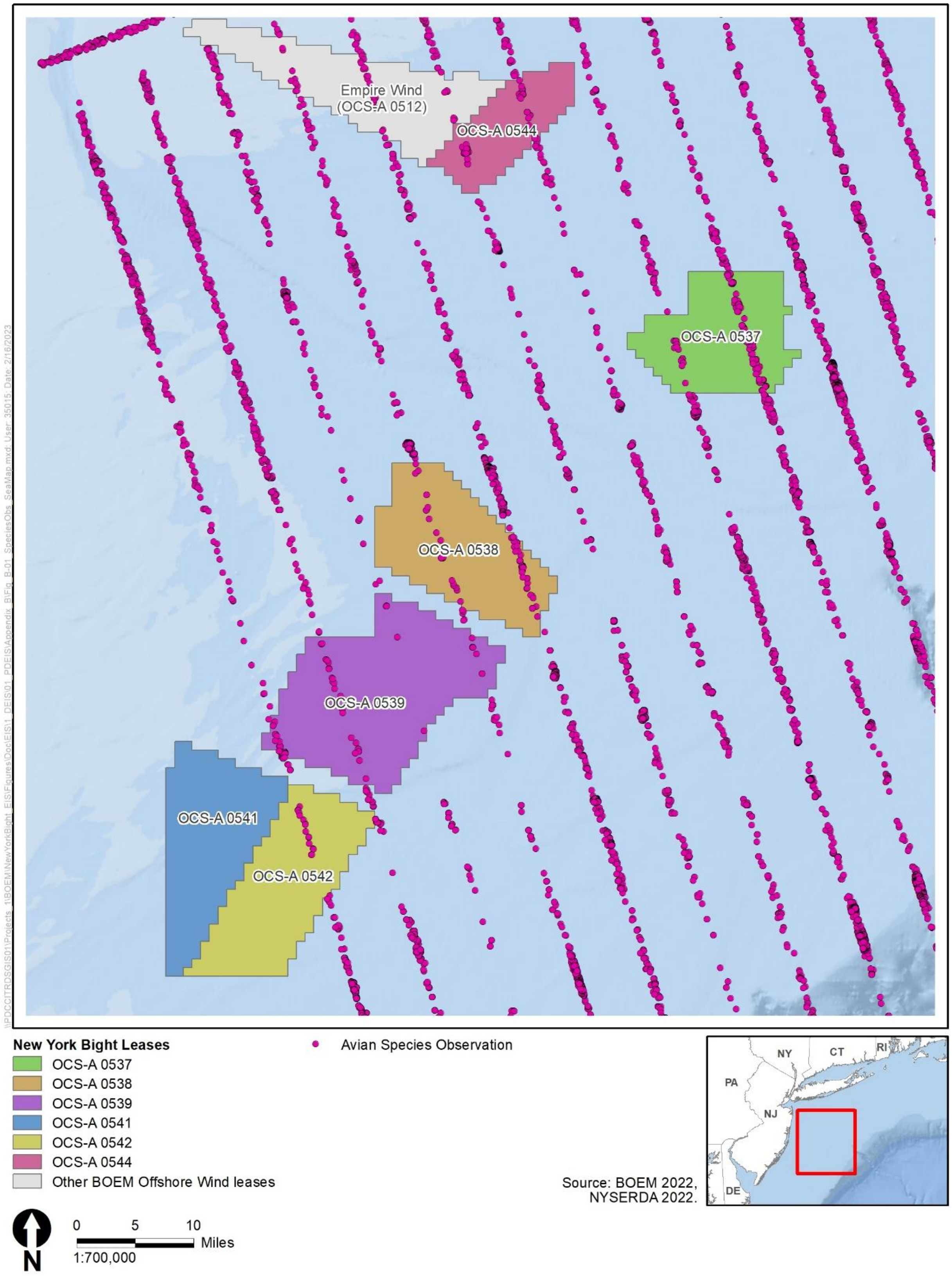


Figure B.2-1. NYSERDA species observation

Datasets from the Northeast Ocean Data Portal show fine-scale use and movement patterns from three species of diving bird—red-throated loon (*Gavia stellata*), surf scooter (*Melanitta perspicillata*), and northern gannet (*Morus bassanus*)—over the course of 5 years. The data were collected throughout the Mid-Atlantic United States waters and represent the probability that an animal will occur within a specific area during a specified time of year, i.e., utilization distributions. As shown on Figure B.2-2 and Figure B.2-3, red-throated loon and surf scoter are less active within the geographic analysis area during fall migration and overwinter distribution, but heavily utilize the Atlantic Flyway during spring migration. In contrast, the northern gannet uses the Mid-Atlantic Flyway and passes through the geographic analysis area year-round for foraging and migration (Figure B.2-4).

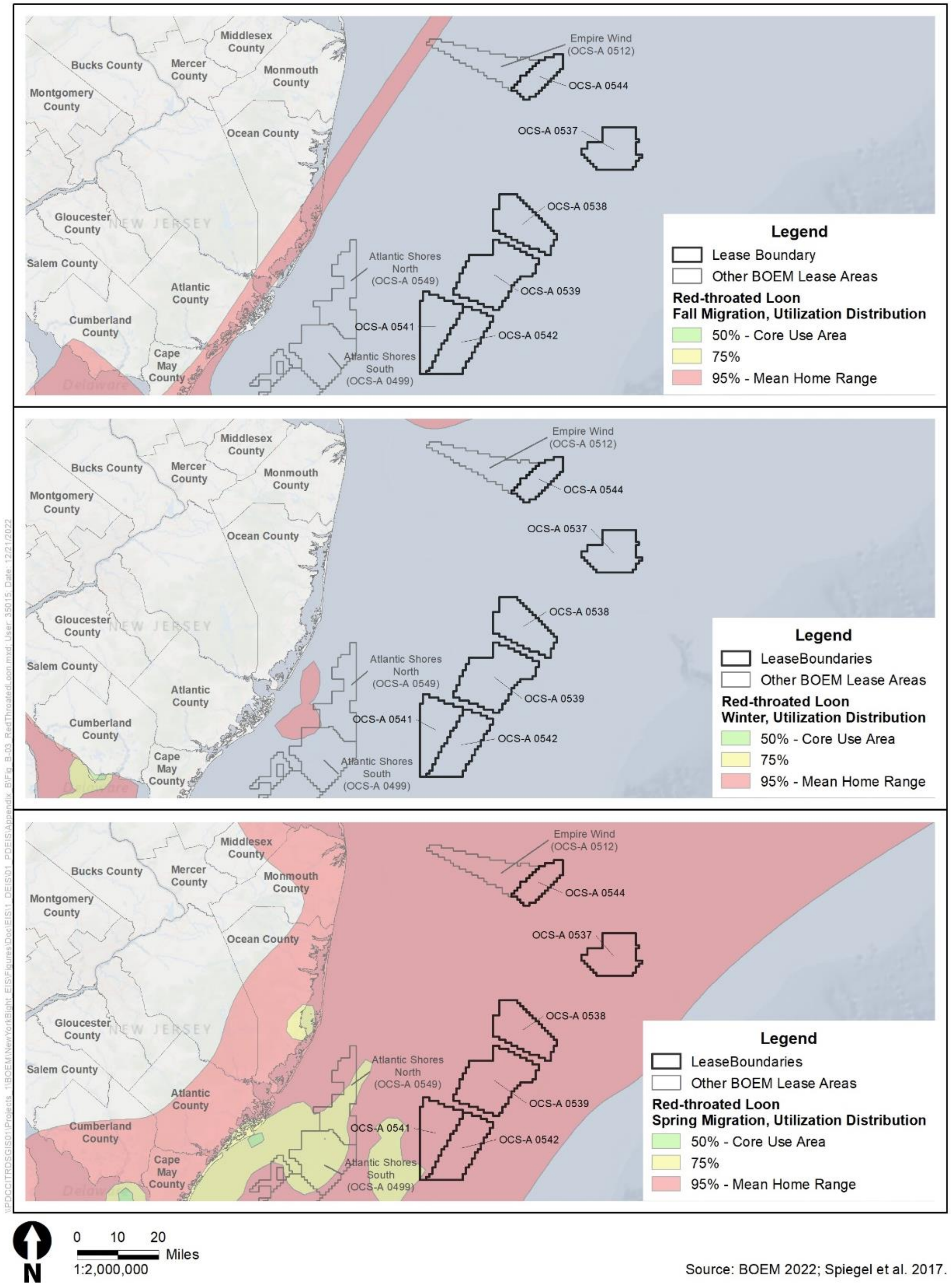
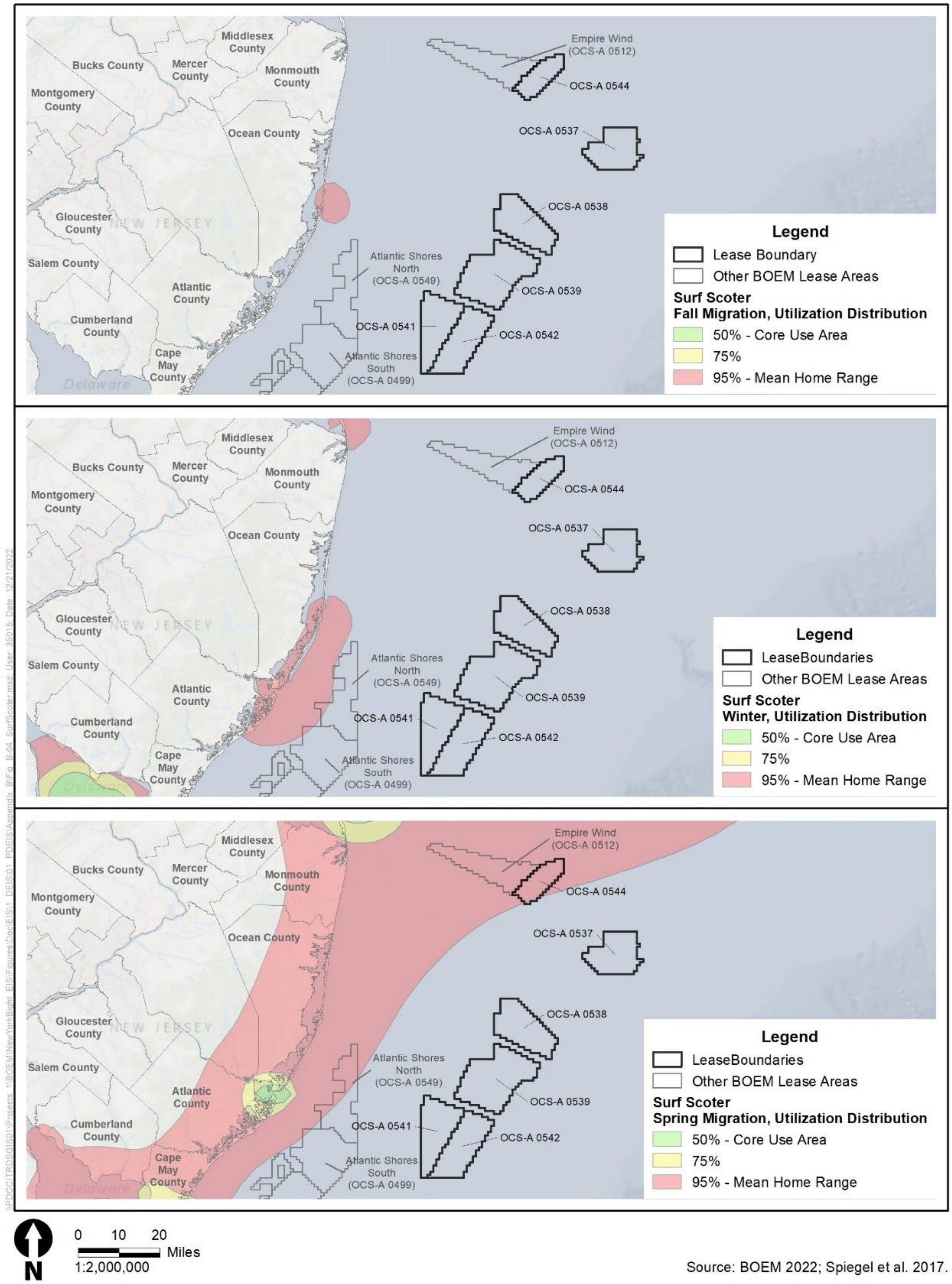
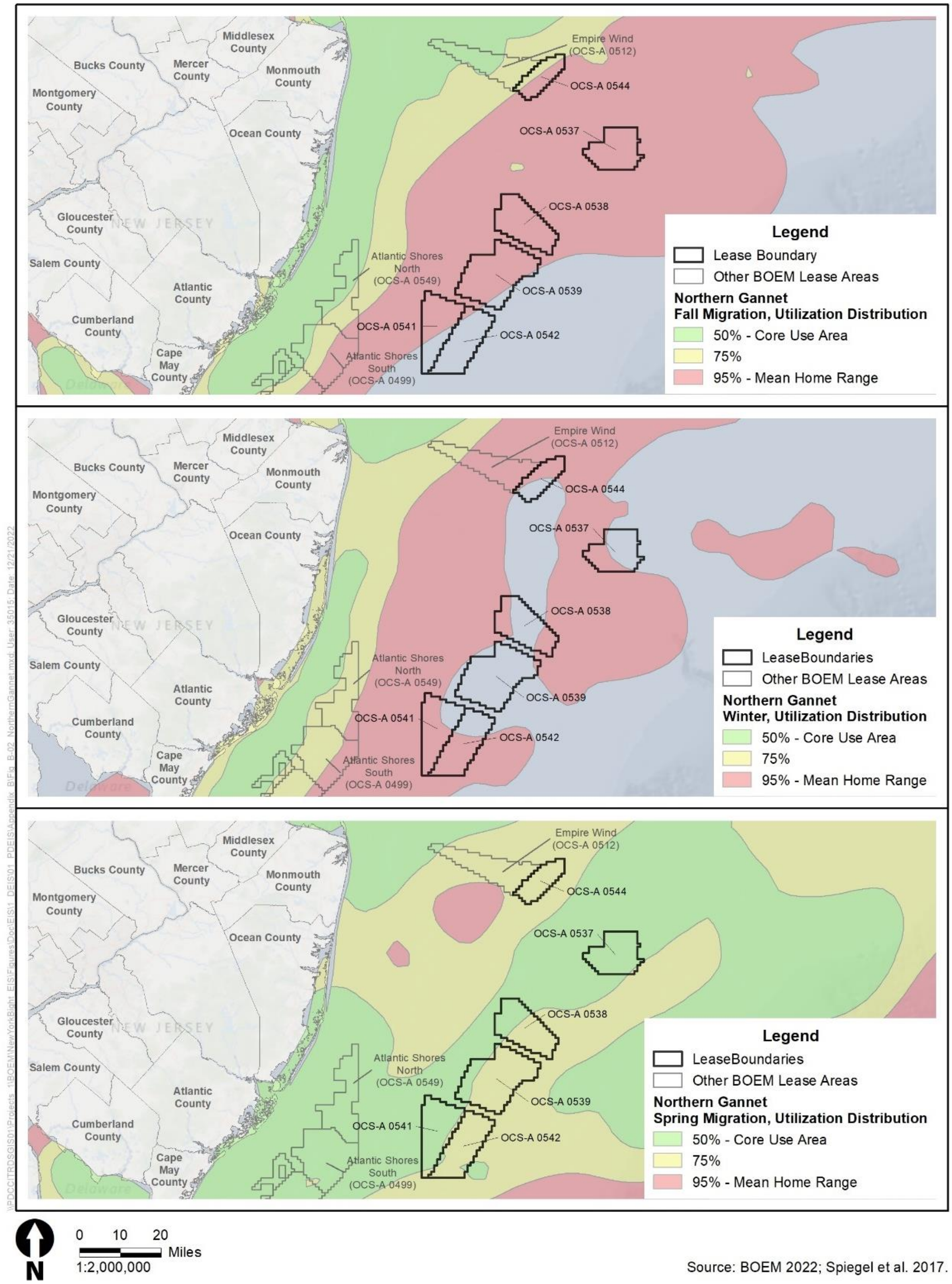


Figure B.2-2. Northeast Ocean Data Portal data – red-throated loon use along Northeastern Atlantic Shore



Source: BOEM 2022; Spiegel et al. 2017.

Figure B.2-3. Northeast Ocean Data Portal Data – surf scoter use along Northeastern Atlantic Shore



Source: BOEM 2022; Spiegel et al. 2017.

Figure B.2-4. Northeast Ocean Data Portal Data – northern gannet use along Northeastern Atlantic Shore

B.3 Wetlands

Table B.3-1 summarizes National Wetlands Inventory (NWI) mapped wetlands in the geographic analysis area. This table is equivalent to Tables 3.5.8-1 and 3.5.8-2 in Section 3.5.8, *Wetlands*, but shows NWI data instead of NJDEP and NYSDEC wetland data.

Table B.3-1. NWI wetland communities in the geographic analysis area

Wetland Community	Acres	Percent of Total
Estuarine and Marine Wetland	136,216	38.3%
Freshwater Emergent Wetland	10,860	3.0%
Freshwater Forested/Shrub Wetland	209,036	58.7%
Total	356,112	100.0%

Source: USFWS 2021.

B.4 Demographics, Employment, and Economics

The analysis presented in Section 3.6.3, *Demographics, Employment, and Economics*, is based on the data included in the tables provided in this appendix. The data have all been downloaded from publicly available sources at the United States Census Bureau and the National Oceanic and Atmospheric Administration. The tables include information from coastal counties in New York and New Jersey within the geographic analysis area.

Table B.4-1. Population and trends within the demographics, employment, and economic geographic analysis area (2000, 2010, and 2020)

Jurisdiction	Population Density (persons/ square mile)	Population (2000)	Population (2010)	Population (2020)	% Change (2000–2020)	% Change (2010–2020)
New York Counties						
Albany County	602	295,106	304,086	314,368	6.5	3.4
Kings County	39,438	2,467,006	2,509,828	2,727,393	10.6	8.7
Nassau County	4,905	1,336,713	1,341,669	1,393,978	4.3	3.9
New York County	429	1,540,547	1,588,767	1,687,834	9.6	6.2
Rensselaer County	247	152,684	159,340	160,923	5.4	1.0
Queens County	22,124	2,229,379	2,230,722	2,405,464	7.9	7.8
Richmond County	8,618	152,684	159,340	160,923	11.3	5.5
Suffolk County	1,675	445,235	469,615	495,522	7.0	2.0
New Jersey Counties						
Atlantic County	494	253,674	274,648	274,534	8.2	0
Burlington County	578	424,453	449,129	461,860	8.8	2.8
Camden County	2,365	506,707	513,275	523,485	3.3	2
Cape May County	379	102,314	97,212	95,263	-6.9	-2
Cumberland County	319	146,263	156,699	154,152	5.4	-1.6
Essex County	6,850	792,253	784,037	863,728	9	10.2

Jurisdiction	Population Density (persons/ square mile)	Population (2000)	Population (2010)	Population (2020)	% Change (2000–2020)	% Change (2010–2020)
Gloucester County	939	256,524	289,150	302,294	17.8	4.5
Hudson County	15,692	610,135	635,652	724,854	18.8	14
Middlesex County	2,791	752,880	810,758	863,162	14.6	6.5
Monmouth County	1,375	616,849	630,461	643,615	4.3	2.1
Ocean County	1,014	523,357	577,564	637,229	21.8	10.3
Salem County	195	64,069	65,980	64,837	1.2	-1.7
Union County	5,599	526,183	537,369	575,345	9.3	7.1

Sources: U.S Census Bureau 2000, 2010, 2020.

Table B.4-2. Age distributions of counties within the demographics, employment, and economic geographic analysis area (2020)

Jurisdiction	0–17	18–34	35–64	65+	Median Age
New York Counties					
Albany County	20%	18%	39%	15.6%	37.8
Kings County	19%	22%	40%	16.5%	35.2
Nassau County	23%	20%	41%	13.6%	41.7
New York County	22%	21%	40%	17.5%	37.5
Rensselaer County	14%	23%	41%	16.2%	39.8
Queens County	20%	23%	41%	17.4%	39.0
Richmond County	20%	18%	35%	16.5%	40.1
Suffolk County	22%	25%	39%	15.9%	41.5
New Jersey Counties					
Atlantic County	22%	27%	37%	15.8%	41.7
Burlington County	22%	28%	37%	17.5%	41.6
Camden County	21%	21%	41%	16.6%	38.8
Cape May County	23%	24%	39%	15.4%	49.6
Cumberland County	18%	21%	41%	25.8%	37.6
Essex County	24%	22%	40%	14.9%	37.6
Gloucester County	24%	20%	40%	13.4%	40.5
Hudson County	22%	22%	40%	15.4%	35.3
Middlesex County	21%	23%	39%	11.7%	38.6
Monmouth County	22%	22%	40%	14.7%	43.3
Ocean County	21%	24%	40%	17.1%	42.7
Salem County	24%	31%	38%	22.4%	42.1
Union County	22%	23%	40%	18.3%	38.7

Source: U.S Census Bureau 2020

Table B.4-3. Race and ethnicity demographics (2020)

Jurisdiction	Minority Populations							White, Non-Hispanic or Latino
	Black	Asian	American Indian/Alaska Native	Native Hawaiian/Other Pacific Islander	Other	Two or More Races	Hispanic or Latino	
New York Counties								
Albany County	12.9%	7.7%	0.2%	0.1%	0.5%	4.7%	6.9%	67.0%
Kings County	26.7%	13.6%	0.1%	0.0%	1.2%	4.1%	18.9%	35.4%
Nassau County	10.5%	11.7%	0.1%	0.0%	0.9%	2.6%	18.4%	55.8%
New York County	11.8%	13.0%	0.1%	0.1%	0.7%	3.7%	23.8%	46.8%
Rensselaer County	7.3%	3.5%	0.2%	0.0%	0.5%	5.3%	5.9%	77.3%
Queens County	15.9%	27.3%	0.4%	0.0%	2.3%	3.5%	27.8%	27.8%
Richmond County	9.4%	11.9%	0.1%	0.0%	0.6%	2.3%	19.6%	56.1%
Suffolk County	7.0%	4.3%	0.2%	0.0%	0.6%	2.7%	21.8%	63.4%
New Jersey Counties								
Atlantic County	14.2%	7.9%	0.1%	0.0%	0.5%	3.5%	19.6%	54.2%
Burlington County	16.2%	5.6%	0.1%	0.1%	0.7%	4.8%	8.7%	63.8%
Camden County	18.2%	6.2%	0.1%	0.1%	0.0%	3.5%	18.2%	53.3%
Cape May County	3.5%	0.9%	0.1%	0.0%	0.3%	3.3%	7.8%	84.0%
Cumberland County	17.1%	1.3%	0.6%	0.0%	0.4%	3.5%	34.4%	42.7%
Essex County	37.5%	5.4%	0.1%	0.0%	1.4%	3.9%	24.4%	27.2%
Gloucester County	10.4%	3.1%	0.1%	0.0%	0.4%	4.1%	7.3%	74.5%
Hudson County	9.8%	17.0%	0.1%	0.0%	1.3%	2.8%	40.4%	28.5%
Middlesex County	9.1%	26.4%	0.1%	0.0%	0.8%	2.5%	22.4%	38.6%
Monmouth County	6.1%	5.6%	0.1%	0.0%	0.7%	3.4%	12.5%	71.6%
Ocean County	2.8%	1.8%	0.1%	0.0%	0.6%	2.6%	10.4%	81.7%
Salem County	14.0%	1.0%	0.3%	0.0%	0.4%	4.4%	10.1%	69.8%

Jurisdiction	Minority Populations							White, Non-Hispanic or Latino
	Black	Asian	American Indian/Alaska Native	Native Hawaiian/Other Pacific Islander	Other	Two or More Races	Hispanic or Latino	
Union County	19.5%	5.6%	0.1%	0.0%	1.1%	3.0%	34.0%	36.7%

Source: U.S Census Bureau 2020

Table B.4-4. Housing characteristics within the demographics, employment, and economic geographic analysis area (2019)

Jurisdiction	Housing Units	Occupied (%)	Vacant (%)	Seasonal Vacancy Rate (%)	Median Value (Owner-Occupied)	Median Monthly Rent (Renter Occupied)
New York Counties						
Albany County	141,553	89%	11%	1.3%	$222,500	$894
Kings County	1,044,493	92%	8%	0.9%	$706,000	$1,322
Nassau County	472,572	95%	5%	0.8%	$493,500	$1,651
New York County	880,085	86%	14%	5.3%	$987,700	$1,646
Queens County	896,333	95%	5%	3.9%	$212,600	$1,629
Rensselaer County	73,011	89%	11%	2.0%	$188,700	$822
Richmond County	180,325	92%	8%	0.5%	$504,800	$1,177
Suffolk County	575,960	85%	15%	9.3%	$397,400	$1,606
New Jersey Counties						
Atlantic County	128,251	78%	22%	13.4%	$217,900	$958
Burlington County	179,414	93%	7%	0.3%	$251,200	$1,190
Camden County	206,078	91%	9%	0.2%	$197,800	$918
Cape May County	99,312	40%	60%	50.8%	$300,500	$975
Cumberland County	56,448	90%	10%	0.7%	$162,500	$858
Essex County	317,314	90%	10%	0.2%	$386,000	$1,044
Gloucester County	113,485	92%	8%	0.3%	$219,700	$1,049
Hudson County	282,039	92%	8%	0.8%	$378,000	$1,265
Middlesex County	301,566	95%	6%	0.5%	$344,100	$1,349
Monmouth County	261,579	90%	10%	4.8%	$421,900	$1,278
Ocean County	283,297	80%	20%	13.8%	$279,000	$1,250
Salem County	27,595	87%	13%	0.7%	$184,600	$836
Union County	202,267	94%	6%	0.2%	$367,200	$1,167

Source: U.S Census Bureau 2019

Table B.4-5. New York and New Jersey employment, unemployment, per capita income, and population living below poverty level (2019)

Jurisdiction	Total Employment	Per Capita Income	Unemployment Rate (%)	Population Living Below Poverty Level (%)
New York Counties				
Albany County	168,609	$66,252	4.5	7.1
Kings County	1,308,399	$60,231	6.2	15.9
Nassau County	716,106	$116,100	3.9	3.8
New York County	955,427	$86,553	5.2	11.8
Queens County	1,851,947	$96,631	3.6	12.2
Rensselaer County	85,822	$68,991	4.7	7.8
Richmond County	225,088	$82,783	4.6	9.4
Suffolk County	785,803	$101,031	4.2	4.5
New Jersey Counties				
Atlantic County	139,427	$62,110	8.4	9.9
Burlington County	241,940	$87,416	5.6	4.1
Camden County	267,725	$70,451	6.6	9.1
Cape May County	45,904	$67,074	6.6	6.9
Cumberland County	66,521	$54,149	7.3	11.9
Essex County	411,493	$61,510	8.1	12.8
Gloucester County	158,168	$87,283	5.5	4.4
Hudson County	377,168	$71,189	5.2	11.8
Middlesex County	429,146	$89,533	5.2	6.2
Monmouth County	335,725	$99,733	4.9	4.7
Ocean County	275,104	$70,909	5.1	6.5
Salem County	31,221	$66,842	6	8.6
Union County	299,082	$80,198	5.7	6.9

Source: U.S. Census Bureau 2019

Table B.4-6. At place employment by industry (2019)

	Agriculture, Forestry, Fishing, Hunting	Mining, Quarrying, Oil/Gas	Utilities	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation and Warehouse	Information
New York Counties									
Albany County	415	45	996	6,889	8,078	2,947	16,084	4,465	3,304
Kings County	1,108	267	4,534	62,088	38,822	26,902	112,845	77,522	56,473
Nassau County	923	79	4,784	39,026	30,149	22,353	67,006	33,784	19,977
New York County	503	68	1,803	17,381	26,719	18,037	62,802	22,676	56,020
Queens County	865	83	4,211	66,835	32,339	20,539	69,331	73,837	23,110
Rensselaer County	467	24	795	5,479	6,030	1,583	7,859	3,833	1,504
Richmond County	180	89	1,763	16,347	5,253	3,455	20,810	13,964	4,955
Suffolk County	2,818	180	5,772	56,475	50,568	24,496	84,785	36,697	19,732
Total for NY Counties	7,279	835	24,658	270,520	197,958	120,312	441,522	266,778	185,075
New Jersey Counties									
Atlantic County	534	58	1,055	8,250	5,936	2,695	14,744	4,503	1,466
Burlington County	750	101	1,895	12,152	17,183	6,989	26,058	10,581	5,004
Camden County	452	40	1,708	14,335	17,795	8,318	30,522	13,354	4,744
Cape May County	375	49	456	4,029	1,219	1,105	4,367	1,189	476
Cumberland County	2,343	123	759	4,030	7,800	2,570	7,621	2,597	612
Essex County	495	75	1,648	23,000	24,863	9,623	36,756	28,211	10,910
Gloucester County	695	133	1,776	10,008	10,933	5,382	17,570	7,305	2,928
Hudson County	245	51	1,014	18,301	24,648	12,718	35,716	26,809	11,795
Middlesex County	433	119	2,988	20,534	36,696	15,315	41,737	28,798	11,543
Monmouth County	893	58	2,772	22,763	18,829	9,382	35,343	12,021	10,974
Ocean County	601	74	3,678	21,245	13,543	7,382	35,419	9,932	4,977
Salem County	560	22	1,248	2,409	3,352	1,155	2,935	1,777	300
Union County	252	123	2,058	16,633	24,984	9,457	28,899	24,525	6,717
Total for NJ Counties	8628	1026	23,055	177,689	207,781	92,091	317,687	171,602	72,446

Source: U.S. Census Bureau 2019.

Table B.4-7. At place employment by industry (2019), continued

	Finance, Insurance, Real Estate	Professional, Scientific, Technical	Management of Companies	Admin, Support, Waste Management	Education, Health Care, Social Assist	Arts/ Entertainment / Recreation	Accommodations and Food	Total
New York Counties								
Albany County	12,415	13,789	149	4,912	44,307	3,191	11,491	133,477
Kings County	91,338	125,666	1,229	46,616	348,257	37,893	85,916	1,117,476
Nassau County	72,230	64,370	770	23,699	199,351	14,672	33,485	626,658
New York County	147,662	156,125	1,654	27,466	208,232	41,370	55,565	844,083
Queens County	74,244	64,154	708	33,484	196,735	13,678	73,420	747,573
Rensselaer County	4,744	6,157	90	2,328	21,749	1,365	5,234	69,241
Richmond County	20,507	15,464	162	9,215	63,882	4,002	10,999	191,047
Suffolk County	51,970	57,882	576	30,365	206,220	15,153	38,811	682,500
Total for NY Counties	475,110	503,607	5,338	178,085	1,288,733	131,324	314,921	4,412,055
New Jersey Counties								
Atlantic County	534	58	1,055	8,250	5,936	2,695	14,744	4,503
Burlington County	750	101	1,895	12,152	17,183	6,989	26,058	10,581
Camden County	452	40	1,708	14,335	17,795	8,318	30,522	13,354
Cape May County	375	49	456	4,029	1,219	1,105	4,367	1,189
Cumberland County	2,343	123	759	4,030	7,800	2,570	7,621	2,597
Essex County	495	75	1,648	23,000	24,863	9,623	36,756	28,211
Gloucester County	695	133	1,776	10,008	10,933	5,382	17,570	7,305
Hudson County	245	51	1,014	18,301	24,648	12,718	35,716	26,809
Middlesex County	433	119	2,988	20,534	36,696	15,315	41,737	28,798

	Finance, Insurance, Real Estate	Professional, Scientific, Technical	Management of Companies	Admin, Support, Waste Management	Education, Health Care, Social Assist	Arts/ Entertainment / Recreation	Accommodations and Food	Total
Monmouth County	893	58	2,772	22,763	18,829	9,382	35,343	12,021
Ocean County	601	74	3,678	21,245	13,543	7,382	35,419	9,932
Salem County	560	22	1,248	2,409	3,352	1,155	2,935	1,777
Union County	252	123	2,058	16,633	24,984	9,457	28,899	24,525
Total NJ Counties	8,628	1,026	23,055	177,689	207,781	92,091	317,687	171,602

Source: U.S. Census Bureau 2019.

Table B.4-8. Ocean economy employment, New York, and New Jersey Counties (2019)

Jurisdiction	Marine Construction	Living Resources	Offshore Mineral Extraction	Ship and Boat Building	Tourism and Recreation	Marine Transportation	Total, All Sectors
New York Counties							
Albany County	Suppressed*	Suppressed*	Suppressed*	Suppressed*	0	535	535
Kings County	107	1,398	Suppressed*	Suppressed*	33,716	1,525	36,746
Nassau County	327	503	32	Suppressed*	17,328	2,387	20,577
New York County	827	560	Suppressed*	Suppressed*	218,880	117	220,384
Queens County	495	332	34	0	11,469	2,524	14,854
Rensselaer County	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Richmond County	149	77	0	190	7,397	275	8,088
Suffolk County	688	594	24	Suppressed*	36,614	3,631	41,398
Total for NY Counties	2593	3464	90	190	325,404	10459	342,047
New Jersey Counties							
Atlantic County	Suppressed*	16	Suppressed*	Suppressed*	11,017	85	11,254
Burlington County	Suppressed*	13	Suppressed*	Suppressed*	0	5,942	11,375
Camden County	85	11	Suppressed*	0	1,062	2133	4,168
Cape May County	100	112	Suppressed*	Suppressed*	10,407	62	11,139
Cumberland County	Suppressed	271	Suppressed*	Suppressed*	1,253	839	2,665

Jurisdiction	Marine Construction	Living Resources	Offshore Mineral Extraction	Ship and Boat Building	Tourism and Recreation	Marine Transportation	Total, All Sectors
Essex County	333	339	Suppressed*	Suppressed*	5,218	2,266	8,476
Gloucester County	314	Suppressed*	Suppressed*	Suppressed*	1,522	6,384	8,293
Hudson County	41	150	Suppressed*	Suppressed*	17,113	4,666	22,652
Middlesex County	104	Suppressed*	Suppressed*	Suppressed*	1,445	19,670	21,581
Monmouth County	113	109	Suppressed*	0	18,483	280	19,042
Ocean County	213	148	Suppressed*	Suppressed*	14,597	38	15,342
Salem County	0	Suppressed*	0	0	716	1,226	1,955
Union County	945	16	Suppressed*	Suppressed*	3,414	4,253	11,707
Total for NJ Counties	2248	1185	0	0	86,247	47844	149,649

Source: NOEP 2022

*"Suppressed" data are those that, although included in summation data, NOAA is withholding because there are few enough respondents in a data category for it to be possible to extract personally (or corporate/ business) identifiable data, e.g., if there is only one marine construction firm in a county, its revenue/employment data is not included in the county total but is included in the state total.

Table B.4-9. Total number of establishments, employment, wages, and GDP for ocean industry economy, by county (2019)

Ocean Sector	Establishments	Employment	Wages, $ millions	GDP, millions	% GDP of NY Coastal Ocean Sector	
					Wages	GDP
New York Counties						
Albany County	37	535	$22	$30	0.2%	0.1%
Bronx County	763	7,095	$214	$417	1.5%	1.3%
Kings County	3,969	36,746	$1,091	$2,319	7.8%	7.4%
Nassau County	1,570	20,577	$636	$1,156	4.5%	3.7%
New York County	9,624	220,384	$9,999	$23,464	71.2%	74.9%
Queens County	1,572	14,854	$472	$822	3.4%	2.6%
Richmond County	891	8,088	$243	$471	1.7%	1.5%
Suffolk County	3,019	41,398	$1,371	$2,651	10%	8.5%
All Ocean Sectors, County	21,445	349,677	$14,047	$31,330	100%	100%
All Ocean Sectors, State	24,019	398,514	$16,111	$35,109	87%	89%
New Jersey Counties						
Atlantic County	651	11,118	$293	$583	7.9%	8.9%
Cape May County	1,052	10,681	$281	$568	7.6%	8.6%

Ocean Sector	Establishments	Employment	Wages, $ millions	GDP, millions	% GDP of NY Coastal Ocean Sector	
					Wages	GDP
Essex County	558	8,156	$407	$712	11%	11%
Hudson County	1,532	21,970	$686	$1,242	18%	19%
Middlesex County	369	21,219	$899	$1,340	24%	20%
Monmouth County	1,403	19,005	$438	$832	12%	13%
Ocean County	1,250	14,996	$332	$659	9%	10%
Union County	405	8,628	$375	$646	10%	10%
All Ocean Sectors, County	7,220	115,773	$3,711	$6,582	100%	100%
All Ocean Sectors, State	9,349	169,654	$6,689	$11,857	55%	56%

Source: NOAA 2022.

B.5 Environmental Justice

The following subsections describe demographic, economic, and social characteristics for each of the counties in the geographic analysis area exceeding environmental justice thresholds as identified in Section 3.6.4, *Environmental Justice*.

B.5.1 Atlantic County, New Jersey

Atlantic County has a population of 265,000 residents with 45 percent of the population identifying as minority in 2020 (U.S. Census Bureau 2020). All households reported English as their primary language (DataUSA 2023a). This information does not reflect that households may have multi-lingual residents or limited English proficiency. Rather, it is the self-reported language spoken by all members of the household.

The median property value in the county was $216,600 and the homeownership rate was 67 percent. The Atlantic County economy employs 125,000 people with the largest industries being health care and social assistance, accommodation and food service, and retail trade. Relevant to ports or offshore wind services, the employment sectors reported for residents of Atlantic County are 6.3 percent in construction, 4.5 percent in manufacturing, and 3.6 percent in transportation and warehousing (DataUSA 2023a).

The largest demographic living in poverty in Atlantic County is females aged 25–34, followed by females 18–24, and females 55–64. The most common race living below the poverty line is White, followed by Hispanic, and then Black. Of children living in Atlantic County in 2021, 15.4 percent were living in poverty, with the rate decreasing over time since 2015 (DataUSA 2023a). Atlantic County has one of the highest percentages of children in New Jersey under 5 years of age living in poverty (New Jersey Department of Health 2023). Food insecurity also has trended downward with 11 percent of the population reported as food insecure in 2021. This is a 5 percent reduction from 2015 (DataUSA 2023a). In 2020, Atlantic County reported a hospitalization rate for asthma of 5.2 cases per 10,000 county residents compared to the state average of 3.8 cases (New Jersey Department of Health 2023).

B.5.2 Camden County, New Jersey

Camden County has a population of 507,000 people with 47 percent identifying as minority in 2020 (US Census Bureau 2020). All households reported English as their primary language (DataUSA 2023b). The median property value in the county was $204,400 and the homeownership rate was 66 percent. More residents drive alone or carpool than take public transportation. Only 6.6 percent rely on public transportation and overall resident commutes average 29 minutes (DataUSA 2023b). The Camden County economy employs 249,000 people with the largest employment for residents being management, education instruction and library, and business and financial operations. Relevant to ports or offshore wind services, the employment sectors reported for residents of Camden County are 4.3 percent in transportation and 4.2 percent in construction and extraction (DataUSA 2023b). The employment rate for Camden County residents declined less than 1 percent from 2019 to 2020 (DataUSA 2023b).

The largest demographic living in poverty in Camden County is females aged 25–34, followed by females 35–44, and females 45–54. The most common race living below the poverty line is White, followed by Hispanic, and then Black. Of children living in Camden County in 2021, 15.3 percent were living in poverty with the rate having decreased slowly from 22 percent since 2015 (DataUSA 2023b). Food insecurity is currently an issue for 10.3 percent of the population, down from over 14 percent in 2015 (DataUSA 2023b). In 2020, Camden County reported a hospitalization rate for asthma of 7.6 cases per 10,000 county residents, double the state average of 3.8 cases (New Jersey Department of Health 2023).

B.5.3 Cumberland County, New Jersey

Cumberland County has a population of 150,000 people with 57 percent identifying as minority in 2020 (US Census Bureau 2020). All households reported English as their primary language (DataUSA 2023c). The median property value in the county was $166,400 and the homeownership rate was 66 percent. The Camden County economy employs 60,400 people with the largest employment for residents being office and administrative support services, sales and related occupations, and production occupations. Relevant to ports or offshore wind services, the employment sectors reported for residents of Cumberland County are 6.0 percent in construction and extraction occupations and 4.9 percent in transportation (DataUSA 2023c). The employment rate for Cumberland County residents declined nearly 2 percent from 2019 to 2020 (DataUSA 2023c).

In Cumberland County, 16 percent of the population lives below the poverty line. The largest demographic living in poverty is females aged 25–34, followed by females 45–54, and females 35–44. The most common race living below the poverty line is White, followed by Hispanic, and then Black. Of children living in Cumberland County in 2021, 19.5 percent were living in poverty with the rate having decreased slowly from 25 percent since 2014 (DataUSA 2023c). Food insecurity is currently an issue for 12.6 percent of the population (DataUSA 2023c). In 2020, Cumberland County reported a hospitalization rate for asthma of 9.2 cases per 10,000 county residents. This is the highest county rate in the state and is more than double the state average (New Jersey Department of Health 2023).

B.5.4 Essex County, New Jersey

Essex County is the third-most populous and second-most densely populated county in New Jersey. The county also has the most Black or African Americans within its boundaries (New Jersey Department of Children and Families 2020). Essex County has a population of 799,000 residents with 72.8 percent of the population identifying as minority in 2020 (U.S. Census Bureau 2020). All households reported English as their primary shared language (DataUSA 2022a). The median property value in the county was $395,900 and the homeowner rate was 44 percent. Over 20 percent of the population relies on public transportation with resident commute times averaging 35 minutes (DataUSA 2022a). The Essex County economy employs 380,000 people with the largest industries being health care and social assistance, retail trade, and educational services. Relevant to ports or offshore wind services, the employment sectors reported for residents of Essex County are 7.4 percent in transportation and warehousing, 6.7 percent in manufacturing, and 6.0 percent in construction (DataUSA 2022a). The employment rate for Essex County grew less than 0.5 percent from 2019 to 2020 (DataUSA 2022a). The wealth of the county is not evenly distributed, with the majority of low-income residents residing in the east, closest to the ports.

In Essex County 15 percent of the population lives in poverty. The largest community within the county, the City of Newark, has over a 35 percent poverty rate and has one of the highest homeless rates in the state (New Jersey Department of Health 2023). The largest demographic living in poverty is females aged 25–34, followed by females 35–44, and females 45–54. The most common race living below the poverty line is Black, followed by Hispanic, and then White. Of children living in Essex County in 2021, 18.4 percent were living in poverty with the rate having decreased slowly from 25 percent since 2015 (DataUSA 2022a). Essex County has one of the highest percentages of children in New Jersey under 5 years of age living in poverty (NJ Dept of Health 2023). In 2020, Essex County reported a hospitalization rate for asthma of 6.7 cases per 10,000 county residents compared to the state average of 3.8 cases (New Jersey Department of Health 2023). Food insecurity is currently an issue for 12.7 percent of the population, down from nearly 20 percent in 2014 (DataUSA 2022a).

B.5.5 Hudson County, New Jersey

Hudson County is the most densely populated county in New Jersey with a population of 672,000 people with 71.5 percent identifying as minority in 2020 (US Census Bureau 2020). All households reported English as their primary language (DataUSA 2023d). The median property value in the county was $400,800 and the homeownership rate was 32 percent. Nearly 40 percent of residents use public transportation to get to work, with an average commute time of 36 minutes. The Hudson County economy employs 360,000 people with the largest employment for residents being management occupations, office and administrative support services, and sales and related occupations. Relevant to ports or offshore wind services, the employment sectors reported for residents of Hudson County are 6.0 percent in transportation and 4 percent in construction and extraction occupations (DataUSA 2023d). The employment rate for Hudson County residents grew almost 1 percent from 2019 to 2020 (DataUSA 2023d).

In Hudson County 14 percent of the population lives in poverty. The largest demographic living in poverty is females aged 25–34, followed by females 35–44, and males 25–34. The most common race living below the poverty line is Hispanic, followed by White, and then Other. Of children living in Hudson County in 2021, 20 percent were living in poverty with the rate having decreased slowly from 30 percent since 2015 (DataUSA 2023d). Food insecurity was an issue for 12.5 percent of the population in 2017 (DataUSA 2023d). In 2020, Hudson County reported a hospitalization rate for asthma of 3.8 cases per 10,000 county residents, the same as the state average (New Jersey Department of Health 2023).

B.5.6 Middlesex County, New Jersey

Middlesex County has a population of 863,000 residents with over 61 percent of the population identifying as minority in 2020 (U.S. Census Bureau 2020). All households reported English as their primary shared language (DataUSA 2022b). The median property value was $351,400 and the homeownership rate was 34 percent. Only 9.2 percent of residents rely on public transportation to get to their place of work and average commutes for residents are 34 minutes. Over 7 percent have “super commutes,” which are commutes over 90 minutes (DataUSA 2022b). The Middlesex County economy employs 408,000 people with the largest industries being health care and social assistance; professional, scientific, and technical services; and retail trade. Relevant to ports or offshore wind services, the employment sectors reported for residents of Essex County are 8.7 percent in manufacturing, 7.4 percent in transportation and warehousing, and 5.1 percent in construction (DataUSA 2022b). The employment rate in Middlesex County rose 0.3 percent from 2019 to 2020.

In Middlesex County 8.7 percent of the population lives in poverty. The largest demographic living in poverty is females aged 25–34, followed by males 18–24, and females 35–44. The most common race living below the poverty line is White, followed by Hispanic, and then Asian. Of children living in Middlesex County in 2021, 11 percent were living in poverty with the rate having decreased slowly from 13 percent since 2014 (DataUSA 2022b). Food insecurity was an issue for 9.6 percent of the population in 2017 (DataUSA 2022b). In 2020, Middlesex County reported a hospitalization rate for asthma of 3.1 cases per 10,000 county residents, which is below the state average (New Jersey Department of Health 2023).

B.5.7 Union County, New Jersey

Union County has a population of 555,200 residents with over 63 percent of the population identifying as minority in 2020 (U.S. Census Bureau 2020). All households reported English as their primary shared language (DataUSA 2023e). The median property value was $378,700 and the homeownership rate was 59 percent. Over 11 percent of residents rely on public transportation to get to their place of work and average commutes for residents are 31 minutes. Nearly 5 percent have “super commutes,” which are commutes over 90 minutes (DataUSA 2023e). The Union County economy employs 283,000 people with the largest industries being health care and social assistance, retail trade, and transportation and warehousing. Relevant to ports or offshore wind services, the employment sectors reported for residents of Union County are 5.9 percent in transportation occupations, 4.9 percent in construction and extraction occupations, and 4.6 percent in production occupations (DataUSA 2023e). The employment rate in Union County rose 0.3 percent from 2019 to 2020.

In Union County 8.8 percent of the population lives in poverty. The largest demographic living in poverty is females aged 25–34, followed by females 35-44, and females 55–64. The most common race living below the poverty line is Hispanic, followed by White, and then Black. Of children living in Union County in 2021, 12 percent were living in poverty. This rate is an increase from 11 percent in 2020 and a decrease from a high of 16 percent in 2014 (DataUSA 2023e). Food insecurity was an issue for 11.4 percent of the population in 2017 (DataUSA 2023e). In 2020, Union County reported a hospitalization rate for asthma of 3.6 cases per 10,000 county residents, which is below the state average (New Jersey Department of Health 2023).

B.5.8 Kings County, New York

Kings County has a population of 2.6 million residents with 64 percent of the population identified as minority in 2020 (U.S. Census Bureau 2020). All households reported English as their primary shared language (DataUSA 2022c). The median property value in Kings County was $734,800 and the homeownership rate was 30 percent. Most residents travel by public transit to work (58 percent) with an overall county average commute time of 43 minutes. The Kings County economy employs 1.22 million people with the largest industries being health care and social assistance; professional, scientific, and technical services; and educational services. Relevant to ports or offshore wind services, the employment sectors reported for residents of Kings County are 6.3 percent in transportation and warehousing, 4.9 percent in construction, and 3.9 percent in manufacturing (DataUSA 2022c). The employment rate in Kings County declined 0.8 percent from 2019 to 2020.

In Kings County 19 percent of the population lives in poverty. The largest demographic living in poverty is females aged 25–34, followed by females 35–44, and males 25–34. The most common race living below the poverty line is White, followed by Black, and then Hispanic. Of children living in Kings County in 2021, 25 percent were living in poverty. This rate is a decrease from 34 percent in 2014 (DataUSA 2022c). Food insecurity was an issue for 14 percent of the population in 2017, the second-highest rate in New York (DataUSA 2022c). For 2017–2019, Kings County reported a hospitalization rate for asthma of 12.6 cases per 10,000 county residents, which is above the state average of 10.2 (New York State Department of Health 2023).

B.5.9 New York County, New York

New York County has a population of 1.6 million residents with 53 percent of the population identified as minority in 2020 (U.S. Census Bureau 2020). All households reported English as their primary shared language (DataUSA 2023f). The median property value in New York County was $1.2 million and the homeownership rate was 24 percent. Most residents travel by public transit to work (55 percent) with an overall county average commute time of 32 minutes. The New York County economy employs 894,000 people with the largest industries being professional, scientific, and technical services; health care and social assistance; and financial and insurance occupations. Relevant to ports or offshore wind services, the employment sectors reported for residents of New York County are only 1.8 percent in transportation occupations, and 1.3 percent in production (DataUSA 2023f). The employment rate in New York County declined 1.25 percent from 2019 to 2020.

In New York County 16 percent of the population lives in poverty. The largest demographic living in poverty is females aged 25–34, followed by females 18–24, and females 55–64. The most common race living below the poverty line is Hispanic, followed by White, and then Black. Of children living in New York County in 2021, 17 percent were living in poverty, a decrease from 27 percent in 2014 (DataUSA 2023f). Food insecurity was an issue for 15 percent of the population in 2017 (DataUSA 2023f). For 2017–2019, New York County reported a hospitalization rate for asthma of 12.5 cases per 10,000 county residents, which is above the state average of 10.2 (New York State Department of Health 2023).

B.5.10 Queens County, New York

Queens County has a population of 2.4 million residents with over 77 percent of the population identified as a minority in 2020 (U.S. Census Bureau 2020). All households reported English as their primary shared language. The median property value in Queens County was $575,600 and the homeownership rate was 45 percent (DataUSA 2022d). Most residents (48 percent) travel by public transit to work with an average commute time of 44 minutes for all county residents. The economy of Queens County employs 1.12 million people with the largest industries being health care and social assistance; retail trade, and accommodation and food services. Relevant to ports or offshore wind services, the employment sectors reported for residents of Queens County are 8.1 percent in transportation and warehousing, 7.3 percent in construction, and 3.4 percent in manufacturing (DataUSA 2022d).

In Queens County 12 percent of the population lives in poverty. The largest demographic living in poverty is females aged 25–34, followed by females 35–44, and females 55–64. The most common race living below the poverty line is Hispanic, followed by White, and then Asian. Of children living in Queens County in 2021, 14 percent were living in poverty, a decrease from 24 percent in 2014 (DataUSA 2022d). Food insecurity was an issue for 13 percent of the population in 2017 (DataUSA 2022d). For 2017–2019, Queens County reported a hospitalization rate for asthma of 11.6 cases per 10,000 county residents, which is above the state average of 10.2 (New York State Department of Health 2023).

B.6 Recreation and Tourism

The following subsections characterize recreational resources within each county in the recreation and tourism geographic analysis area.

B.6.1 Kings County, New York

Kings County comprises a total of 97 square miles (250 square kilometers), of which 71 square miles (183 square kilometers) are land and 26 square miles (67 square kilometers) are water. Kings County is located at the far western tip of Long Island and contains the New York City borough of Brooklyn. Kings County has 10 nature preserves and parks (New York City Department of Parks and Recreation 2023; New York State Office of Parks, Recreation and Historic Preservation 2023) that include the Brooklyn Botanic Garden; Prospect Park; Coney Island; Floyd Bennett Field and Jamaica Bay Wildlife Refuge, which are shared with Queens County; and the first municipal airport in New York City that is now part of the National Park System. There are seven marinas serving Kings County (New York City Department of Parks and Recreation 2023), with one county-operated marina.

There were 3,720 tourism and recreation establishments in the county that supported just under 34,000 employees in 2019. Tourism and recreation generated just under $980 million in annual payroll and provided the state with a GDP of $2,081,896,633 (NOEP 2022).

B.6.2 Queens County, New York

Queens County comprises a total of 178 square miles (460 square kilometers), of which 108 square miles (280 square kilometers) are land and 70 square miles (180 square kilometers) are water. Queens County has numerous parks and recreation areas (New York City Department of Parks and Recreation 2023), including national parks (Breezy Point, Canarsie Pier, Floyd Bennett Field, Fort Tilden, Jacob Riis Park, and the Jamaica Bay Wildlife Refuge) and State of New York Parks (Bayswater Point State Park and Gantry Plaza State Park). There are two marinas serving Queens County (New York City Department of Parks and Recreation 2023), with one marina operated by the county.

There were 1,390 tourism and recreation establishments in the county that supported just under nearly 12,000 employees in 2019. Tourism and recreation generated just under $235 million in annual payroll and provided the state with a GDP of $545,211,625 (NOEP 2022).

B.6.3 Richmond County, New York

Richmond County, better known as Staten Island, comprises a total of 103 square miles (265 square kilometers), of which 59 square miles (152 square kilometers) are land and 44 square miles (114 square kilometers) are water. Staten Island is home to 24 nature preserves, of which 22 have freshwater wetland or salt marsh habitat (New York City Department of Parks and Recreation 2023). There are two marinas serving Richmond County (New York City Department of Parks and Recreation 2023), with one county-operated marina. The East Shore of Staten Island is home to the 2.5-mile F.D.R. Boardwalk, the fourth-longest in the world.

There were 846 tourism and recreation establishments in the county that supported just under 7,397 employees in 2019. Tourism and recreation generated nearly $179 million in annual payroll and provided the state with a GDP just over $360 million (NOEP 2022).

B.6.4 Suffolk County, New York

Suffolk County encompasses 2,373 square miles (6,150 square kilometers)—of which 912 square miles (2,360 square kilometers) are land and 1,461 square miles (3,780 square kilometers) are water—and has about 1,000 miles of coastline. Recreational areas in Suffolk County include national wildlife refuges, national seashore, state parks and forests, and tidal wetland areas. Notable coastal recreational resources include Montauk Point State Park, Robert Moses State Park, Captree State Park, and Gilgo State Park. Suffolk County has the most lighthouses of any county in the United States, and includes the Fire Island Lighthouse, which was an important landmark for trans-Atlantic ships entering the New York Harbor in the early 20th century. Captree State Park, located on the eastern tip of Jones Island, is home to the largest public fishing fleet on Long Island. Open and charter boats are available for saltwater fishing, sightseeing excursions, and scuba diving trips. Popular spots for surf fishing in Suffolk County include Camp Hero State Park and Montauk Point State Park (New York State Office of Parks, Recreation and Historic Preservation 2023). The Suffolk County Parks Department has several full-service watercraft facilities, including four marinas and two boat ramps/launches. There are dozens of marinas serving Suffolk County (CountyOffice.org 2023a).

There were 4,016 accommodation and food service establishments in the county in 2019. Together, these generated over $1.3 billion in annual payroll. There were 937 arts, entertainment, and recreation establishments in Suffolk County, which bring in approximately $354 million in annual payroll (U.S. Census Bureau 2021a, 2021b).

B.6.5 Nassau County, New York

Nassau County comprises a total of 453 square miles (1,174 square kilometers), of which 285 square miles (737 square kilometers) are land and 168 square miles (436 square kilometers) are water. Nassau County is a densely populated county on western Long Island. Recreational areas include Bethpage State Park, Hempstead Lake State Park, Oyster Bay National Wildlife Refuge, Lido Beach Wildlife Management Area, and Jones Beach State Park. Jones Beach State Park is one of the most heavily visited beaches on the East Coast, with an estimated 8.5 million visitors in 2018 (New York State Office of Parks, Recreation and Historic Preservation 2022). Visitors to Jones Beach can swim; enjoy the boardwalk; fish; dine; visit the WildPlay Adventure Park; play miniature golf, shuffleboard, basketball, corn hole, paddle tennis, table tennis, and pickleball; and attend concerts at Northwell Health Theatre. For recreational fishing, Jones Beach offers fishing piers, a bait and tackle shop, and a boat basin that allows boaters day use of the park throughout the boating season. The county operates boat launches at four county parks (Nassau County 2023).

There were 3,812 accommodation and food service establishments in the county in 2019. Together, these generated over $1.3 billion in annual payroll. There were 928 arts, entertainment, and recreation establishments in Nassau County, which bring in approximately $559 million in annual payroll (U.S. Census Bureau 2021a, 2021b).

B.6.6 Monmouth County, New Jersey

Monmouth County encompasses 472 square miles (1,223 square kilometers) of land, including 27 miles (44 kilometers) of Atlantic coastline and 26 miles (42 kilometers) of Raritan Bay coastline. There are 30 parks in Monmouth County, many of which have campgrounds, and bays, ponds, creeks, reservoirs, and lakes for fishing. There are 148 miles (238 kilometers) of trails for walkers, runners, cyclists, and equestrians (Monmouth County Park System 2022), and there are eight wildlife management areas in the county, the largest of which is Assunpink (6,393 acres [2,587 hectares]) (NJDEP 2021). The county is home to 21 museums and many local breweries, distilleries, wineries, and golf courses. Popular tourist attractions include the annual Belmar Seafood Festival, jazz festivals, county fairs, and beach movie viewings (Monmouth County Park System 2022). It is home to 12 boardwalks, such as the Asbury Park Boardwalk, which is lined with music venues, food establishments, and shops (Monmouth County Park System 2022). The 1,655-acre (670-hectare) Sandy Hook Peninsula, which is a unit of the Gateway National Recreation Area, is a very popular tourist destination and is frequented by two million tourists every year (National Park Service 2022). It is home to two landmarks, Fort Hancock and the Sandy Hook Lighthouse, and is popular among bird watchers, as it is used by over 300 species of birds (NJDEP 2022).

The county has 17 public beaches that are heavily frequented by tourists during the summer months for swimming, boating, fishing, and scuba diving. The county has three public beachfront areas: Seven

Presidents Oceanfront Park in Long Branch, Bayshore Waterfront Park in Port Monmouth, and Fisherman's Cove Conservation Area in Manasquan, and it is home to 34 marinas, including the Monmouth Cove Marina (CountyOffice.org 2023b).

There were 1,870 accommodation and food service establishments in the county in 2019. Together, these generated over $576 million in annual payroll. There were 488 arts, entertainment, and recreation establishments in Monmouth County, which brought in approximately $197 million in annual payroll (U.S. Census Bureau 2021a, 2021b).

B.6.7 Ocean County, New Jersey

Ocean County is in the center of the Jersey Shore region, with approximately 629 square miles (1,792 square kilometers) of land. The county provides an array of recreational beaches, boardwalks, marinas, and wildlife areas. Popular activities include fishing, hiking, biking, kayaking, golfing, and sightseeing (Ocean County 2022). Ocean County has 27 parks and conservation areas, with over 4,000 acres (1,619 hectares) of preserved land. Sixteen wildlife management areas fall within Ocean County, including Greenwood Forest (32,353 acres [13,093 hectares]), which is partly in Burlington County (NJDEP 2021). Popular coastal attractions include lighthouses, the Tuckerton Seaport, Jenkinson's Boardwalk, and annual seafood and music festivals (Ocean County 2022).

The Edwin B. Forsythe National Wildlife Refuge consists of more than 47,000 acres (19,020 hectares) of coastal habitats and provides wildlife viewing and nature trails. The Barnegat Lighthouse State Park is located on the northern tip of Long Beach Island and provides panoramic views of Barnegat Inlet as well as trails through maritime forests, birding sites for waterfowl, fishing sites, and nature walks.

There were 1,292 accommodation and food service establishments in the county in 2019. Together, these generated over $342 million in annual payroll. There were 272 arts, entertainment, and recreation establishments in Ocean County, which bring in approximately $116 million in annual payroll. Approximately 6.4 percent of all housing units in Ocean County are for seasonal, occupational, or occasional use (U.S. Census Bureau 2021a; 2021b).

B.6.8 Atlantic County, New Jersey

Atlantic County lies in the southern peninsula of New Jersey and encompasses approximately 556 square miles (1,440 square kilometers) of land. Most of the Tuckahoe-Corbin City Fish and Wildlife Management Area is within Atlantic County and consists of approximately 17,500 acres (7,082 hectares) of tidal marsh, woodlands, fields, and impoundments (NJDEP 2018). Ten wildlife management areas totaling 55,360 acres (22,403 hectares) also fall within or partially within Atlantic County: Absecon (3,946 acres [1,597 hectares]), Cedar Lake (360 acres [146 hectares]), Great Egg Harbor River (7,552 acres [3,056 hectares]), Hammonton Creek (5,720 acres [2,315 hectares]), Makepeace Lake (11,737 acres [4,750 hectares]), Malibu Beach (257 acres [104 hectares]), Maple Lake (4,789 acres [1,938 hectares]), Pork Island (868 acres [351 hectares]), Port Republic (1,471 acres [595 hectares]), and Tuckahoe (18,660 acres [7,551 hectares]) (NJDEP 2021).

The county is known for its boardwalk along the beach of Atlantic City, with its nine casinos with restaurants, nightclubs, and game rooms (Stockton University 2021). The county has nine beaches, which collectively total 14 miles (23 kilometers), and 5.75 miles (9.25 kilometers) of boardwalk (Atlantic City 2021). There are several boat launches and marinas in the county, which have small recreational boat rentals. Recreational fishing is permitted on the beaches, outside of guarded areas, and from the jetties. There are also multiple fishing piers available to the public.

There were 827 accommodation and food service establishments in the county in 2019. Together, these generated over $1.2 billion in annual payroll. There were 113 arts, entertainment, and recreation establishments in Atlantic County, which bring in approximately $41 million in annual payroll. Approximately 13.4 percent of all housing units in Atlantic County are for seasonal, occupational, or occasional use (U.S. Census Bureau 2021a, 2021b).

B.6.9 Cape May County, New Jersey

Cape May is New Jersey's southernmost county and encompasses 251.5 square miles of land. There are many parks, state forests, and wildlife management areas in Cape May County. The Cape May National Wildlife Refuge encompasses 11,500 acres (4,654 hectares) of grasslands, saltmarshes, and beachfront (Friends of Cape May National Wildlife Refuge n.d.). The Cape May Coastal Wetlands Wildlife Management Area extends along the coast of Cape May County and occupies approximately 17,842 acres (7,220 hectares) (NJDEP 2021).

Cape May County is considered one of the premier beach destinations along the Mid-Atlantic coast. The Ocean City Boardwalk is more than 2 miles (3 kilometers) long and is lined with shops and amusement park rides. The Wildwood Boardwalk runs from Wildwood into North Wildwood and is home to many amusement attractions (Cape May County 2022). Recreational fishing occurs along the back bays and from the surf, piers, and boats along the Jersey Cape (Cape May County 2022).

There were 917 accommodation and food service establishments in the county in 2019. Together, these generated over $240 million in annual payroll. There were 143 arts, entertainment, and recreation establishments in Cape May County, which brought in approximately $50 million in annual payroll. Approximately 50.9 percent of all housing units in Cape May County are for seasonal, occupational, or occasional use (U.S. Census Bureau 2021a, 2021b).

B.7 Offshore Wind Vessel Types

Over 25 different types of vessels are expected to be used to construct, operate, and maintain an offshore wind project. The vessels shown in Table B.7-1 are expected to be representative of the vessels used for the NY Bight projects (ACP 2021). Multiple vessels will be needed for each offshore wind project, but the exact number and types will be dependent on project size, distance from shore, environmental conditions, and other factors. The majority of these vessels will be coastwise qualified (i.e., United States-flagged vessels with American crews that are built in the United States).

Different types of vessels are projected to be needed during the different offshore wind project stages, including Surveying, Cable Lay, Component Transfer, Turbine Installation, Development, Construction, Decommissioning, and Operations and Maintenance (O&M). As outlined in Table B.7-1, Service Operation Vessels (SOVs) and Crew Transfer Vessels (CTVs) will be the primary vessel used by the offshore wind industry. These vessels would be coastwise qualified vessels and used across the lifetime of each project in both the construction and O&M phases. Additionally, there are a large variety of vessels that could be used during the 2–3-year construction and surveying stages, many of which will be coastwise qualified. The number of coastwise quality vessels used during construction are anticipated to grow as factories and supply chains are built in the United States. The number of vessels estimated for each class of vessel in Table B.7-1 is for a typical 800-megawatt offshore wind project. However, the number and type of vessels used will vary greatly between projects, depending on the selected installation techniques, distance from shore, the rate of construction of the domestic supply chain, and other factors.

Table B.7-1. Vessels used throughout the 35-year lifetime of a typical offshore wind project, including both construction and O&M

Vessel Type	Approximate Number of Vessels	Vessel Activities Conducted
Project Lifetime		
Crew Transfer Vessel (CTV)	Construction: 1–4 Vessels O&M: 0–3 Vessels	CTVs transfer personnel and light equipment in support of construction and O&M. During construction, both the developer and turbine manufacturer are likely to hire two CTVs, respectively. For nearshore projects (less than ~1.5 hours from port) CTVs will be primary for O&M; further offshore projects will use SOVs.
Service Operation Vessel (SOV)/Walk to Work/ Commissioning Support Vessel	Construction: 0–2 Vessels O&M: 0–3 Vessels	These vessels are equipped with motion compensated gangway allowing turbine technicians to "walk to work" directly from the vessel to the turbine. Use of SOVs or CTVs depends mostly on distance of the project from shore. Most, but not all, projects will utilize SOVs. During construction, SOVs assist with wind turbine installation and commissioning (bringing turbine and cables online). Developers and turbine manufacturers are likely to hire one SOV each. During O&M, SOVs would be used for turbine servicing and operation.
Surveying		
Environmental Survey	2–4 Vessels	Environmental survey vessels conduct fisheries and benthic surveys on export cable routes and in the lease area. They are also used to place LIDAR buoys for various environmental assessments. A variety of vessels do this work: nearshore work tends to be smaller vessels, and offshore work uses larger vessels.
Geotechnical Survey	1–6 Vessels	Geotechnical survey vessels conduct physical sampling and testing of seabed characteristics to optimally place turbines and cables, typically by conducting borings or sampling to specific depths below the mean seabed.
Geophysical Survey	1–6 Vessels	Geophysical survey vessels acoustically map seabed features, surface, and sub surface within a lease area and potential Export Cable Routes. Detects and charts unexploded ordinances (UXO).

Vessel Type	Approximate Number of Vessels	Vessel Activities Conducted
Cable Laying		
Export Cable Laying Vessel	1–2 Vessels	Export Cable Laying Vessels are large, specialist cable installation vessel equipped with 1–2 high-capacity carousels capable of reeling long lengths of large diameter export cables, exporting from cable manufacturing facility and installation on wind farm sites. Typically, a dynamic positioning vessel is used for installation in water depths greater than 32.8 feet (10 meters). These vessels will also physically sample and test seabed characteristics to optimally place cables, typically by conducting borings or sampling to specific depths below the mean seabed. These vessels also have the potential to include cable burial spread.
Shallow Water Export Cable Lay Vessel	1–2 Vessels	These vessels are flat-bottomed vessels/barges equipped with medium to large carousel(s) and anchor handling spreads for cable installation in water depths ranging from 0 feet/meters (beached) to approximately 32.8 feet (10 meters). The vessels would handle cable installation from cable landing/Horizontal Directional Drilling (HDD) sites to water depths for typical dynamic positioning vessel. These vessels also have the potential to include cable burial spread.
Nearshore Export Cable Landing Support Barge	1–2 Vessels	These are vessels used for landfall and nearshore support works, support for HDD and landfall pull-in operation of export cable.
Export and Array Cable Support Vessels	2–6 Vessels	A variety of ancillary cable installation support vessels will be used during construction: cable jointing/splicing cables, multiact shallow water anchor handling, spud leg pontoon, lift-boat/jack up for shallow water operations, Pre-lay Grapnel Run vessel, and fisheries support vessels. During O&M, these vessels will be used for cable subsea inspection and repairs.
Cable Crossing Construction Vessel	1–2 Vessels	Cable Crossing Construction vessels are used for installation of cable protection structures (mattresses, rock bags, grout bags) in a range of water depths from nearshore (shallow) to offshore wind farm site (deepwater).
Array Cable Laying Vessel	1–3 Vessels	These vessels are used for cable installation between turbines and from turbines to offshore substations. Typically installed with crew transfer facilities and cable pull in equipment for cable installation into each turbine. These vessels also have the potential to include cable burial spread.
Anchor Handling Vessels	2–6 Vessels	These vessels are used to support multi-anchor cable installation. Cable installation barges can have 8–12 anchors in shallow water.
Cable Trenching Vessel	1–2 Vessels	These vessels create trenches in the seafloor to lay cable. These can be nearshore (shallow water) or offshore (deepwater) vessels equipped with cable pre- or post-lay burial tool, typically A-Frame launched seabed trencher – remotely operated vehicle Jetter/Cutter, Cable plow, Jetting sled. These vessels have the potential to require bollard pull (cable plow).

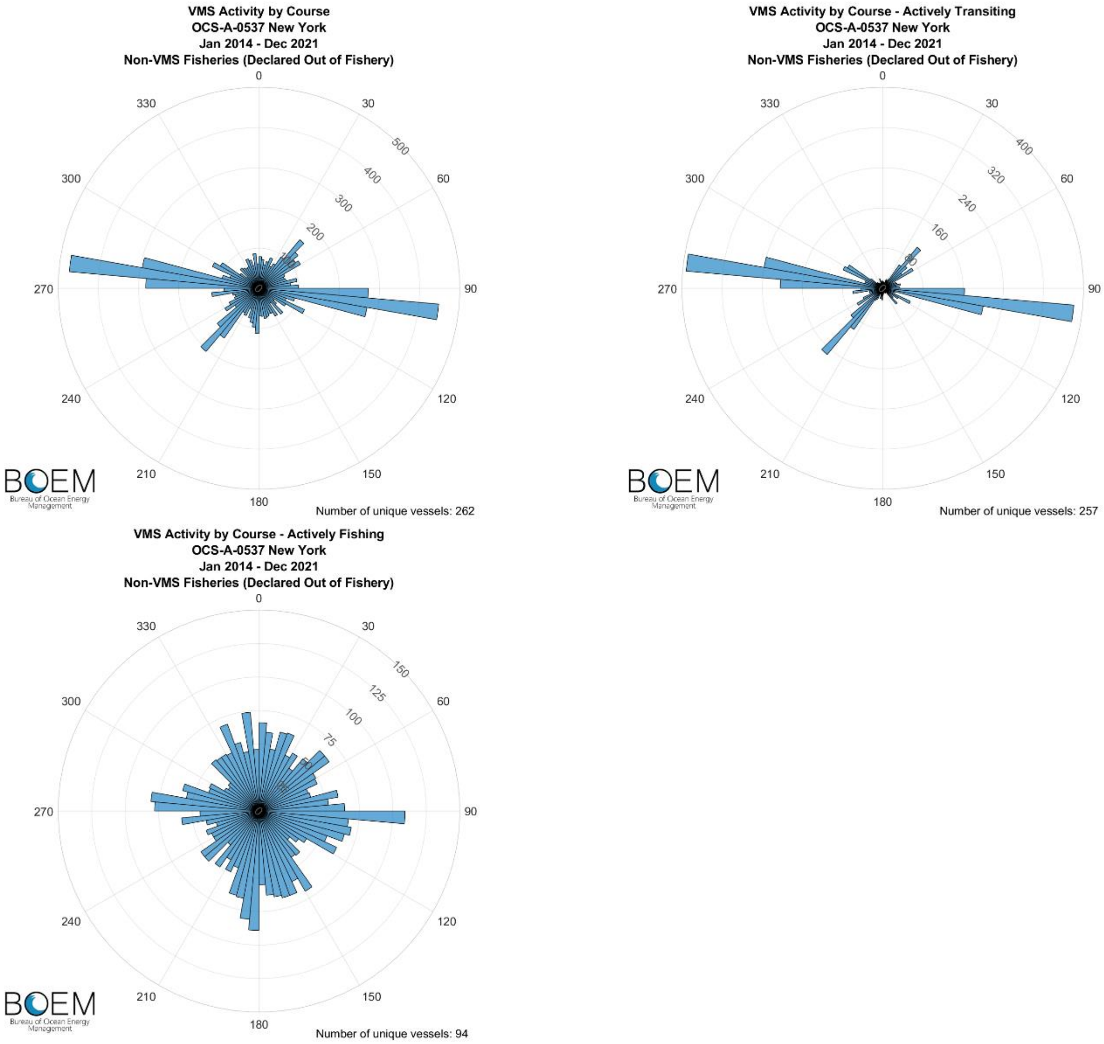
Vessel Type	Approximate Number of Vessels	Vessel Activities Conducted
Development, Construction, & Decommissioning		
Floating Heavy Lift Foundation Vessel	1–2 Vessels	These vessels are utilized in substation, transition piece, and foundation installation, including pile-driving. Most are floating, but sometimes a jack up vessel is used.
Wind Turbine Installation Vessel	1–2 Vessels	During construction, these vessels are utilized in turbine installation. During O&M, these vessels are utilized for main component exchange, such as replacing nacelles, generators, gear boxes. If not coastwise qualified, they would be paired with a feedering spread.
Feedering Spread: Barges and Ocean-Going Tugs	2–3 Vessels	Feedering spreads are a newer installation concept in the offshore wind industry. Feeder barges supply components to installation vessels from port in compliance with the Jones Act. These vessels are likely to vary depending on the experience of the initial offshore wind projects in the United States. Feedering spreads include coastwise concepts such as: towed barges, self-propelled vessels, or ultra large lift boats. The number of vessels will depend on the feedering concept and the number of wind turbine installation vessels. A towed barge spread would likely include large deck barges with motion compensation systems, offshore tugs for station keeping, transit tugs towing barges from port to offshore locations, and port tugs for marshalling/port movements. Zero feedering spreads are required with a coastwise qualified wind turbine installation vessel. These vessels are only for installation, and not transportation between ports.
Supply Chain Transportation	2–3 Vessels	All vessels will need to be coastwise qualified vessels in order to move components between the United States manufacturing sites and marshalling areas.
Rock Dumping/Scour Protection Vessel	1–2 Vessels	These vessels are used to install protective rock for seabed infrastructure (such as cables and foundations), and are utilized in multiple phases (e.g., site preparation, scour rock around monopile, application of rock scour on top of cables, etc.).
Dredging Vessels	2–4 Vessels	Dredging vessels are used to level or lower the seafloor in preparation for construction of cables and turbines. Dredging vessels include Trailing Suction Hoppers, Cutter Suction Hoppers, and Grab Hoppers.
Safety/Scout Vessel	1–4 Vessels	Safety/Scout vessels are used during Surveying and Construction, and ensure operational safety with ongoing marine traffic, look out for fixed fishing gear, and interface with fishing vessels.
Noise Mitigation Vessel	1 Vessel	These vessels are used to create a bubble curtain to mitigate noise from pile-driving.
Accommodation Vessel	0–2 Vessels	Accommodation vessels house the turbine technicians, and other crew during favorable weather windows, such as the summer months.
Construction Support Vessel	5–25 Vessels	These vessels carry fuel, supplies, and other support equipment to construction vessels.

Source: ACP 2021.

B.8 Commercial Fisheries and For-Hire Recreational Fishing

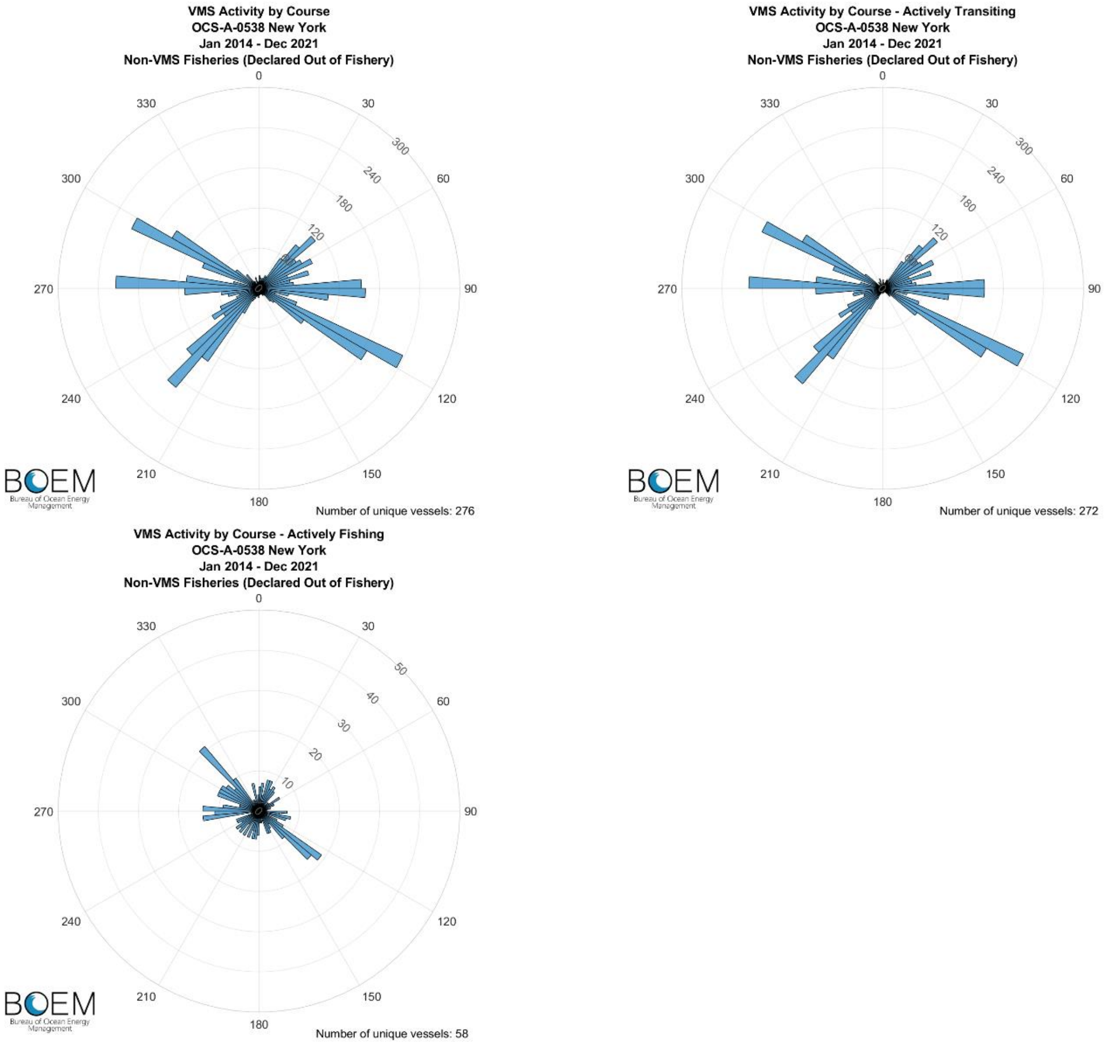
Using Vessel Monitoring System (VMS) data conveyed in individual position reports (pings) from January 2014 to December 2021, the Bureau of Ocean Energy Management (BOEM) compiled information about fishing activities in the NY Bight lease areas (NMFS 2021). Figure 3.6.1-2 through Figure 3.6.1-19 in Section 3.6.1, *Commercial Fisheries and For-Hire Recreational Fishing*, cover all fishing activities (transiting and active fishing) for VMS fisheries. Data on non-VMS fisheries are presented here. Figure B.8-1 to Figure B.8-6 provide the histograms for non-VMS fisheries.[3] The larger bars in the polar histograms represent a greater number of position reports showing fishing vessels moving in a certain direction in the NY Bight lease areas. The polar histograms differ with respect to their scales. Non-VMS vessels operated in an east–west direction in OCS-A 0537, while vessels in OCS-A 0538 operated in a northwest–southeast direction. Non-VMS vessels in the remaining lease areas generally operated in a northeast–southwest direction.

[3] VMS coverage is not universal for all fisheries. Non-VMS data have been declared as out of fishery, meaning they have been declared out of a fishery managed by days-at-sea effort controls (i.e., scallops, northeast multispecies, and monkfish).



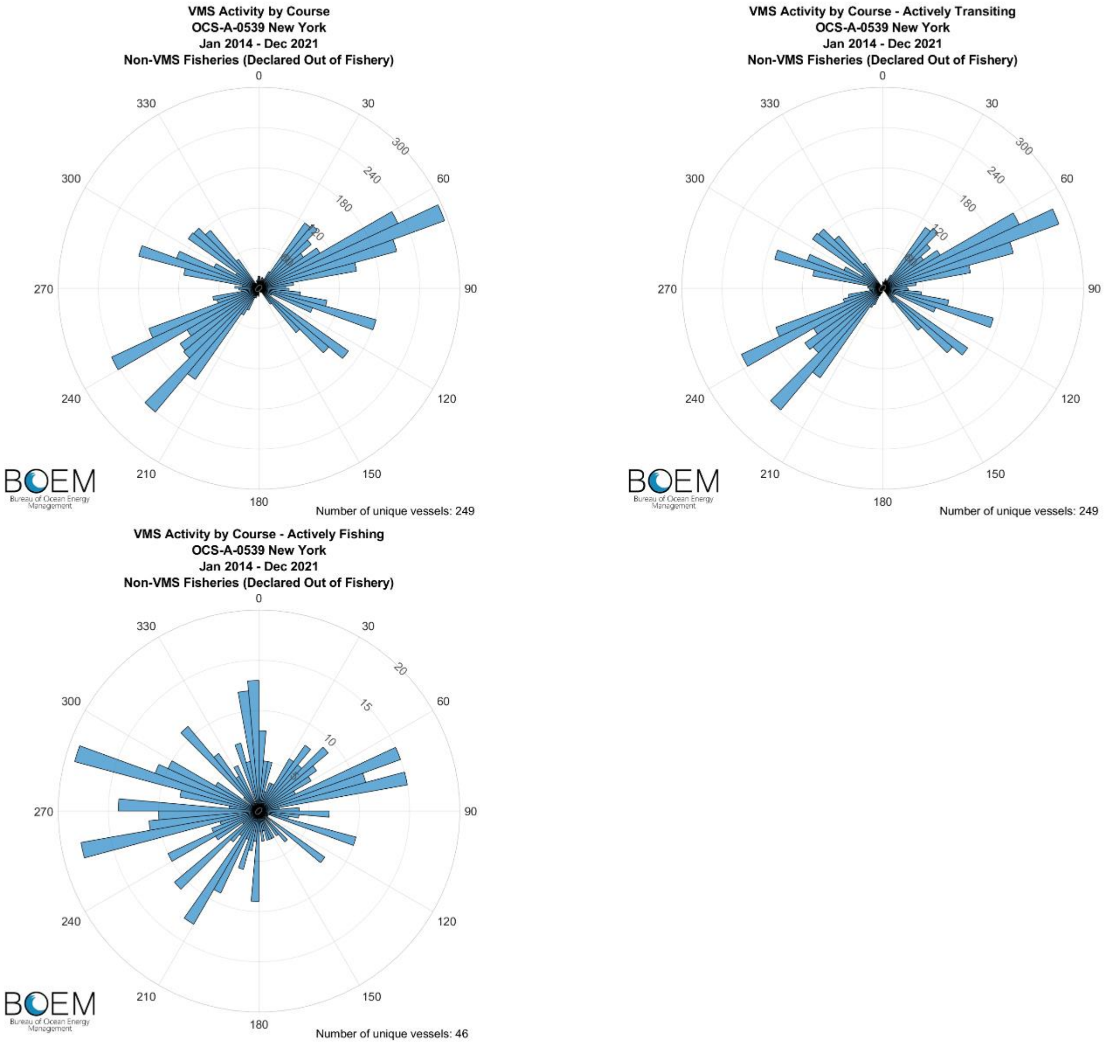
Source: Developed by BOEM using VMS data provided by NMFS (2021).

Figure B.8-1. VMS bearings of non-VMS fishery vessels at all speeds, transiting, and fishing within Lease Area OCS-A 0537 by FMP fishery, January 2014–December 2021



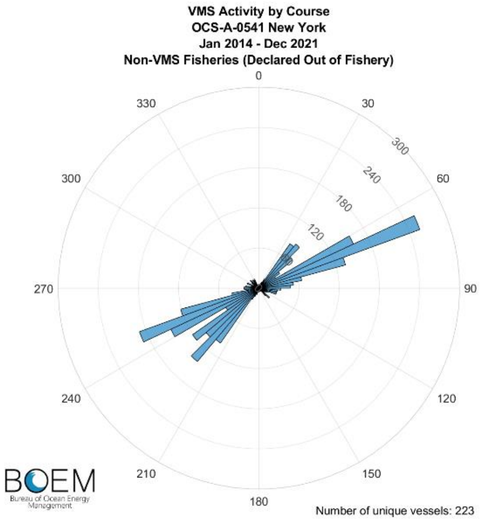
Source: Developed by BOEM using VMS data provided by NMFS (2021).

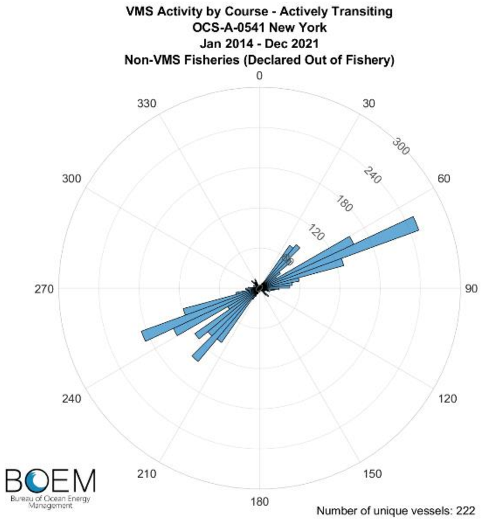
Figure B.8-2. VMS bearings of non-VMS fishery vessels at all speeds, transiting, and fishing within Lease Area OCS-A 0538 by FMP fishery, January 2014–December 2021

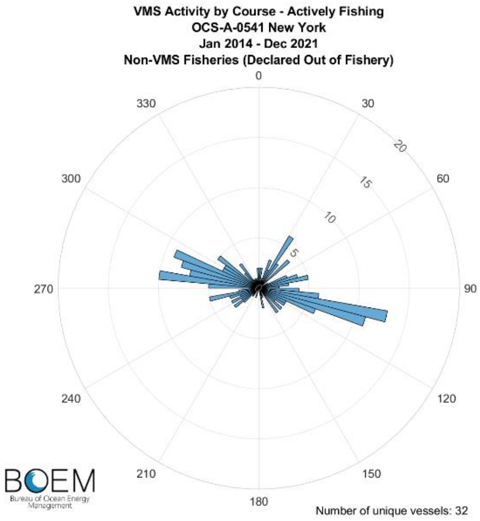


Source: Developed by BOEM using VMS data provided by NMFS (2021).

Figure B.8-3. VMS bearings of non-VMS fishery vessels at all speeds, transiting, and fishing within Lease Area OCS-A 0539 by FMP fishery, January 2014–December 2021

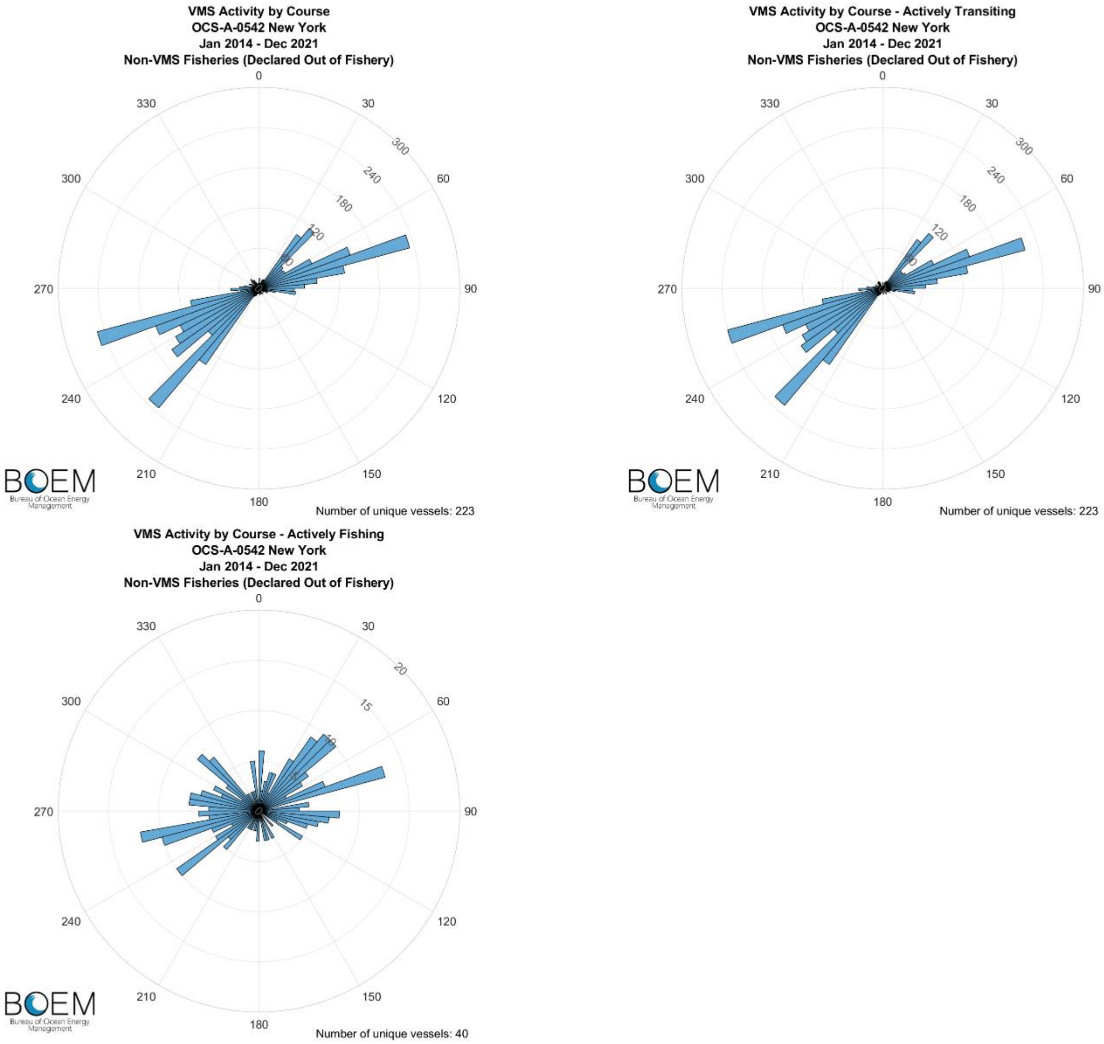






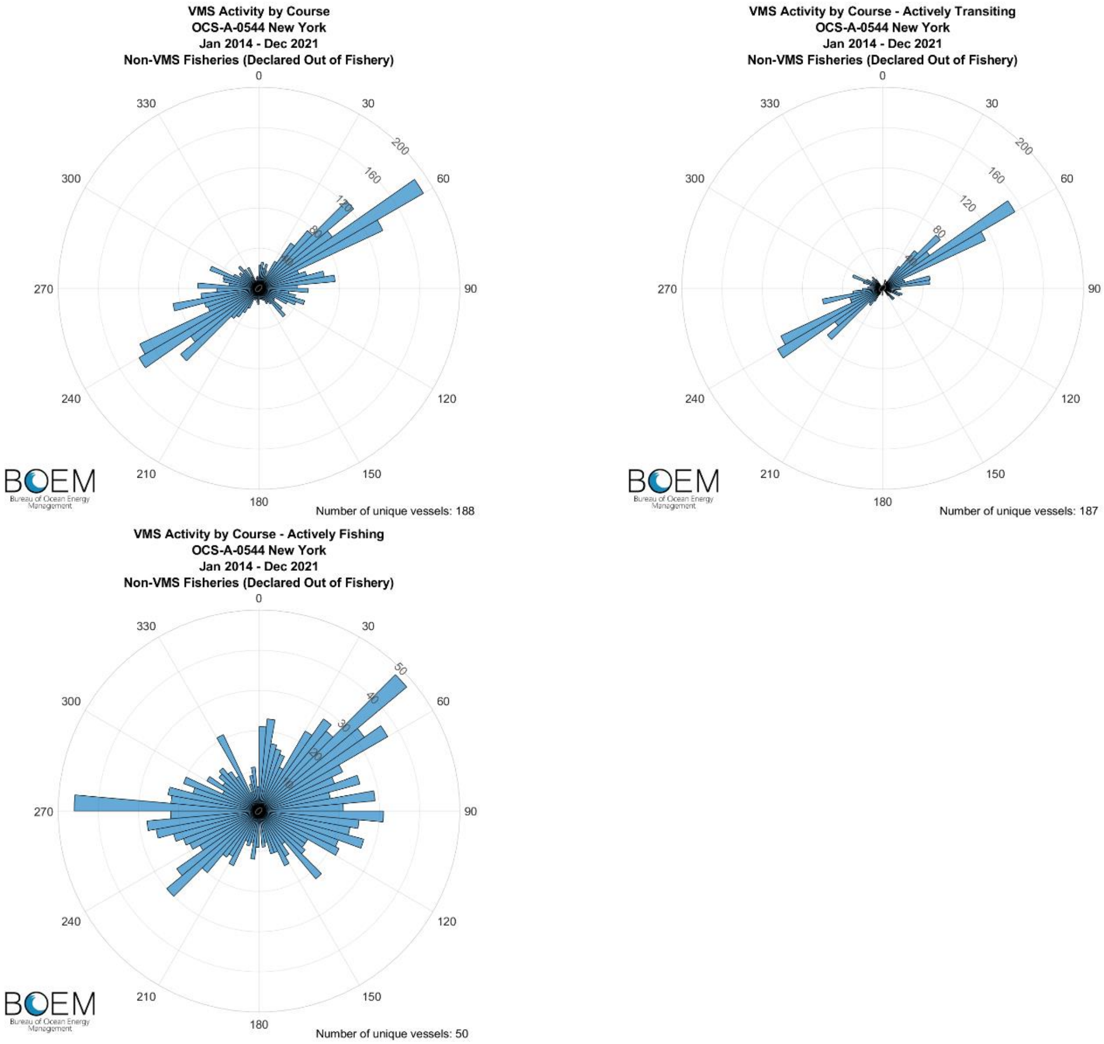
Source: Developed by BOEM using VMS data provided by NMFS (2021).

Figure B.8-4. VMS bearings of non-VMS fishery vessels at all speeds, transiting, and fishing within Lease Area OCS-A 0541 by FMP fishery, January 2014–December 2021



Source: Developed by BOEM using VMS data provided by NMFS (2021).

Figure B.8-5. VMS bearings of non-VMS fishery vessels at all speeds, transiting, and fishing within Lease Area OCS-A 0542 by FMP fishery, January 2014–December 2021



Source: Developed by BOEM using VMS data provided by NMFS (2021).

Figure B.8-6. VMS bearings of non-VMS fishery vessels at all speeds, transiting, and fishing within Lease Area OCS-A 0544 by FMP fishery, January 2014–December 2021

B.9 Use of New and Emerging Technologies – AMMM Measure MUL-21

Under Alternative C, BOEM is evaluating the potential for new and emerging technologies to reduce environmental impacts from the NY Bight projects through implementation of avoidance, minimization, mitigation, and monitoring (AMMM) measure MUL-21 (see Appendix G, *Mitigation and Monitoring*, for full text of the measure). As part of this measure, BOEM encourages lessees to explore new technologies that may avoid or reduce impacts during construction, O&M, and decommissioning compared to more conventional methods. This section describes five examples of new and emerging technologies that could be evaluated for deployment for the NY Bight projects. This list of new and emerging technologies is not exhaustive, and lessees may identify other technologies that could be implemented to avoid or reduce impacts as part of MUL-21. The technological readiness of each of the following technologies varies and commercial application may not be feasible for the NY Bight leases depending on the timing of the proposed development schedule for each lease area. The description of the technologies is largely based on research conducted by the National Renewable Energy Laboratory (NREL) (NREL 2023). As these technologies are new and largely untested in the offshore wind industry, not all have been subject to detailed study, and additional information about the specific design and deployment of these technologies would be needed to fully assess impacts.

Closed-loop cooling: Some offshore wind projects may use high-voltage direct current (HVDC) offshore converter stations that would convert alternating current to direct current before transmission to onshore project components. These HVDC systems are typically cooled by an open-loop system that intakes cool sea water and discharges warmer water back into the ocean, resulting in the potential for impingement and entrainment of organisms and thermal plumes (for a detailed description of these impacts, refer to Section 3.4.2, *Water Quality*, Section 3.5.2, *Benthic Resources*, Section 3.5.5, *Finfish, Invertebrates, and Essential Fish Habitat*, Section 3.5.6, *Marine Mammals*, and Section 3.5.7, *Sea Turtles*). A subsea cooler is an example of a closed-loop cooling technology that has been successfully used for commercial subsea gas production. Subsea cooler technology does not yet have demonstrated commercial application for offshore wind, but it is an emerging technology that could become viable on the timeline of the NY Bight projects (NREL 2023). As opposed to a topside cooling system that intakes seawater on an offshore HVDC converter station as analyzed under Alternative B, a subsea cooler would be located on the seabed by the HVDC converter platform and would reject heat directly to the surrounding ocean, relying on ambient ocean flows and passive thermal convection to circulate seawater past the submerged cooling tubes. Because the system does not intake or discharge seawater, there would be no impingement/entrainment impacts and no discharge of sodium hypochlorite anti-fouling solution. While there would be no discharge of warmer water, passive cooling would be expected to result in some warming of the surrounding ocean.

This technology could minimize impacts associated with discharges/intakes impact-producing factor (IPF) for the following resources: water quality; benthic resources; finfish, invertebrates, and essential fish habitat (EFH); marine mammals; and sea turtles.

Quieter monopile installation: Alternate quieter pile-driving methods include seawater hammers, vibro-driving with electromechanical vibrating units clamped to a suspended monopile, and a method that combines vibro-driving with water jets. The seawater hammer method raises a large column of seawater above the pile head and then releases it to fall on the pile resulting in a longer pulse duration reducing the pulse intensity. Vibro-driving units use rotating eccentric weights operating at low frequencies (<20–40 Hertz) to induce flexural oscillations of the monopile, whose weight is suspended by crane from a surface vessel. The vibro-driving with water jets uses both vibration and water to fluidize the soil inside the monopile. These quieter monopile installation methods can yield a 20 decibel (dB) or greater reduction in source noise levels relative to unmitigated conventional impact hammering resulting in a reduction in the radius of induced marine life behavioral response (NREL 2023). For a detailed description of impacts related to conventional impact hammering, refer to Section 3.5.2, *Benthic Resources;* Section 3.5.5, *Finfish, Invertebrates, and Essential Fish Habitat;* Section 3.5.6, *Marine Mammals;* and Section 3.5.7, *Sea Turtles*.

This technology could reduce noise source levels, thereby reducing potential noise impacts on marine mammals, sea turtles, finfish, and invertebrates, producing fewer behavioral changes in these species and reducing the risk of injury. However, the seawater hammer and the combined vibro-driving with water jets method could also result in additional impacts associated with the discharge/intakes IPF for the following resources: benthic resources; finfish, invertebrates, and EFH; marine mammals; and sea turtles as each method requires intake of seawater for operation resulting in impingement and entrainment of organisms. The impacts relative to the discharge/intake IPF will have to be evaluated on a project-by-project basis since the water system flow requirements are governed by the pile dimensions and the seabed soil.

Cable-in-pipe array cable installation: The Representative Project Design Envelope (RPDE) analyzed under Alternative B for the NY Bight projects considers the following interarray cable installation methods: mechanical or jet plowing options including trencher, precision installation (using a remotely operated vehicle/diver), mechanical cutter, controlled flow excavator, jet plowing, and vertical injection. A new and emerging technology allows for the remote installation of unarmored cables from offshore electric service platforms by pressurized water flow in thermoplastic conduit pipe that has been pre-laid and buried in the seabed. This method allows for seamless transitions from the conduit pipe turbine to turbine along an array cable string. The array cable-in-pipe system uses pressurized water injected into pre-laid thermoplastic pipe, and the water flow pushes one or more pigs attached to the front end of the cable (and along the cable, as needed) enabling the cable to be carried through the pipe by the pressurized water flow (NREL 2023).

Cable-in-pipe installation enables the use of standard onshore cables on standard drums, which have a wider range of cable suppliers, and which could reduce cable supply costs compared with armored submarine cable. Moreover, unarmored cable has 10–15 percent less power loss than armored cable, due to induced current in the armor wires. In addition, repair and replacement of damaged cable can be done within the conduit pipe without disturbing the seabed. Implementation of this technology could reduce the impacts associated with periodic repair and maintenance needed for interarray cables associated with the cable emplacement and maintenance IPF for the following resources: benthic resources; finfish, invertebrates, and EFH; marine mammals; and sea turtles.

Self-installing frond mats: The RPDE analyzed under Alternative B for the NY Bight projects considers the following potential scour protection methods for WTG and OSS foundations: rock, mattress protection, sandbags, and stone bags. A new and emerging technology that lessees could install in place of these conventional scour protection methods is self-installing frond mattresses. Self-installing frond mats involve pre-attaching frond mat panels around a monopile or suction bucket. Once the foundation is at the target embedment depth, the panels would be released, much like an unfolding, inverted umbrella (NREL 2023). Test results have shown that self-installing frond mats can provide effective scour protection around both monopiles and suction bucket jackets, capable of limiting the depth of localized scour. Use of self-installing frond mats to replace conventional riprap scour protection would have the environmental benefit of substantially reducing the demand for subsea rock installation vessels, potentially eliminating hundreds of vessel trips and associated impacts, including reduced air emissions, underwater noise levels, accidental releases, and vessel strike. Frond mats can also result in the buildup of naturally contoured sandbank around the fronded area, avoiding potential edge scour that can occur with stone riprap layers. Conversely, using frond mats instead of rock or concrete scour protection could reduce benefits from an increase in hard surfaces for benthic species dependent on hardbottom habitat.

This technology could minimize resource impacts associated with the accidental releases, air emissions, noise, and vessel traffic IPFs for the following resources: air quality; water quality; marine mammals; finfish, invertebrates, and EFH; and sea turtles. This technology could reduce beneficial impacts associated with the presence of structure IPF for the following resources: benthic resources.

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Appendix C: Tiering Guidance

The Bureau of Ocean Energy Management (BOEM) has prepared this Draft Programmatic Environmental Impact Statement (PEIS) to evaluate the impacts that could result from wind energy development activities in the six New York Bight (NY Bight) lease areas, as well as the change in those impacts that could result from adopting programmatic avoidance, minimization, mitigation, and monitoring (AMMM) measures. The Proposed Action for the PEIS is the adoption of programmatic AMMM measures that BOEM may require as conditions of approval for activities proposed by lessees in Construction and Operations Plans (COPs) submitted for the six NY Bight lease areas. Project-specific National Environmental Policy Act (NEPA) analyses for individual COPs in the NY Bight lease areas will tier to or incorporate by reference this PEIS, in accordance with 40 Code of Federal Regulations (CFR) 1501.11-12. The project-specific NEPA analyses and consultations for each NY Bight lease area will focus on the impacts of approving a particular COP, including identification of additional AMMM measures that are best suited for consideration in the COP-specific NEPA analysis.

This appendix provides clarification on how BOEM anticipates using this PEIS to provide for greater efficiency and reduce duplication of analyses in complying with NEPA requirements for future COP-specific NEPA analyses. The information in this appendix is organized by resource topic in a tabular format. For each resource topic, an overview of the affected environment, impact analysis, and AMMM measure contents in the PEIS is provided. For each of these components of the analysis, this appendix also provides recommendations for information from the PEIS that could be incorporated by reference into the future COP-specific NEPA analyses and identifies general information about additional analysis that BOEM anticipates would need to be performed as part of the COP-specific NEPA analysis once detailed and site-specific project information is available. BOEM may determine additional analysis is needed during the COP-specific NEPA process.

Table C-1. PEIS and COP-specific NEPA tiering guidance

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
Section 3.4.1, Air Quality and Greenhouse Gas Emissions	**Affected Environment.** Provides a discussion of the geographic analysis area, National Ambient Air Quality Standards (NAAQS), and attainment status of the area. PEIS Appendix B, *Supplemental Information and Additional Figures and Tables*, provides metocean and climate information and trends.	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the relevant affected environment characterization in the PEIS. While it is anticipated that the geographic analysis area of a specific NY Bight lease area would be a subset of the geographic analysis area in the PEIS, additional characterization may be necessary if this is not the case. Additional characterizations of air quality in localized areas around onshore facilities will be warranted in the COP-specific NEPA analysis to the extent community-level air quality data are available.
	Impact Analysis. Provides quantitative analysis of project emissions, avoided health effects, social cost of greenhouse gases (GHGs), and a qualitative assessment of expected air quality/GHG impacts, based on generic or representative assumptions, for a highest-emissions scenario in accordance with the representative project design envelope (RPDE).	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference the impact analysis in the PEIS. The COP-specific NEPA analysis should focus on what is unique about the project and how emissions and the locations of air quality impacts would differ from the PEIS. In addition, the COP-specific NEPA analysis should include quantitative modeling (dispersion and photochemical as applicable) to estimate ambient concentrations of criteria pollutants for comparison to the NAAQS and to assess impacts on Air Quality-Related Values. This modeling may be coordinated with the modeling required for the U.S. Environmental Protection Agency (USEPA) Outer Continental Shelf (OCS) air quality permit but should include all project emissions sources (not just those required for the permit). Air quality assessment for environmental justice communities affected by the project may also be appropriate.
	AMMM Measures. Includes the use of sulfur hexafluoride (SF_6)-free switchgear; incorporation of ecological design elements; use of alternative fuels; and use of low or zero emission technology.	**AMMM Measures.** If applicable, the lessee should provide descriptions of any planned use of measures such as Best Available Control Technology/Lowest Achievable Emission Rate technology, emissions offsets, alternative fuels or electrification for vessels/equipment/vehicles, Best Management Practices, fugitive dust controls, and vehicle traffic management.
Section 3.4.2, Water Quality	**Affected Environment.** Provides a regional overview of the current water quality conditions within the geographic analysis area. Data are gathered from publicly available information such as the USEPA Coastal Condition Assessments and World Ocean Database, BOEM NEPA documents and environmental studies, scientific papers, and other COPs (e.g., sediment transport modeling from Empire Wind (OCS-A 0512)).	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the water quality affected environment characterization in the PEIS for the offshore project area only. For the onshore project area, the COP-specific NEPA analysis will need to characterize water quality specifically in all areas where onshore components could be sited, including the cable landfall(s), onshore export cable routes, points of interconnection (POI), substations, operations and maintenance (O&M) facilities, ports, above ground transmission lines, or any other infrastructure proposed in the onshore environment that will support the project. The information should include a description of the water quality conditions in the onshore project area. At a minimum, the data from the state Section 305(b) Water Quality Reports and Section 303(d) List of Impaired/Total Maximum Daily Load (TMDL) Waters should be included.

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
	Impact Analysis. Provides qualitative analysis of impacts on overall water quality by impact producing factor (IPF) (e.g., accidental releases, cable emplacement and presence of structures and discharges) based on the RPDE.	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference the qualitative impact analysis in the PEIS for the offshore project area; however additional analysis such as sediment transport modeling associated with cable emplacement would be required to fully characterize the water quality impacts along the offshore export cable routes. In the onshore project area, the COP-specific NEPA analysis can incorporate by reference the general impacts on water quality associated with the IPFs. However, quantitative information is needed to address potential impacts associated with crossings of wetlands and waterbodies. This information would allow BOEM to provide a more accurate impact conclusion than that in the PEIS.
	AMMM Measures. Includes reducing potential for release of metal contaminants; submittal of oil spill response plan; submittal and approval of an anchoring plan to reduce or avoid impacts from turbidity and anchor placement; employment of methods to minimize sediment disturbance; use of upgrading or retrofitting technology, new and emerging technologies; and development of an Inadvertent Returns Plan.	**AMMM Measures.** The COP-specific NEPA analysis would include the recommended water quality AMMM measures specific to the IPFs. It would be expected that issuance of the Section 401 Water Quality Certificate from the state would include permit conditions including specific measures to avoid and minimize potential water quality impacts.
Section 3.5.1, Bats	**Affected Environment.** In the offshore environment, existing literature, and acoustic studies are used to describe bat species in the geographic analysis area. Bat information specific to the NY Bight lease areas is based on two New York State Energy Research and Development Authority (NYSERDA) meteorological buoys deployed in two of the NY Bight lease areas, as well as bat surveys conducted at nearby lease areas (e.g., Ocean Wind 1 (OCS-A 0498), Atlantic Shores South (OCS-A 0499), Empire Wind (OCS-A 0512)). Bat presence in the coastal onshore environment is primarily based on bat ranges that overlap with the coastal areas of New Jersey and New York.	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the bat affected environment characterization in the PEIS for the offshore environment only. For the onshore environment, the COP-specific NEPA analysis will need to characterize habitats specifically in all areas where onshore components could be sited, including the offshore export cable landing(s), onshore export cable routes, POIs, substations, O&M facilities, ports, above ground transmission lines, or any other infrastructure proposed in the onshore environment that will support the project. The information should include a description of the forest habitat and acreage in the onshore project study area. At a minimum, an on-the-ground reconnaissance level field survey is recommended in order to map forest habitat at the onshore project components, including along all onshore export cable routes.
	Impact Analysis. In the offshore environment, the impact analysis is qualitative for the IPFs assessed. However, because current information on bat abundance/presence in the offshore environment indicates that bat presence is low, BOEM anticipates the exposure to any of the IPFs in the offshore environment to also be low, and, therefore, impacts on bats in the offshore environment are not anticipated to have any notable effect on bat populations. In the onshore environment, the impact assessment is qualitative and largely focuses on the land disturbance IPF.	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference the qualitative impact analysis in the PEIS for the offshore environment. Because current information indicates low bat presence in the offshore environment, offshore development for the NY Bight lease areas would not be likely to have different impacts than those described in the PEIS. In the onshore environment, the COP-specific NEPA analysis can incorporate by reference the noise and presence of structures IPFs. However, quantitative information is needed to address potential impacts on bat habitat (forest areas). Ideally, the habitat areas mapped for the Affected Environment (see above) along with the potential locations of all onshore project components, would

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
	Because the types and locations of onshore project components are not known, there could be a range of impacts that are dependent upon the type and amount of habitat that could be removed (forest habitat is of primary concern for bats). While BOEM anticipates that bat habitat impacts in the onshore environment would be minimal due to likely siting of project components in already disturbed areas (based on recent wind projects BOEM is reviewing), it is still possible that areas of forested habitat would be altered or removed. Therefore, BOEM cannot rule out more substantial bat habitat impacts without project-specific information.	allow for a quantitative assessment of forest impacts. Forest impacts should also differentiate between permanent (complete removal or conversion) and temporary impacts, as well as potential tree trimming. This information would allow BOEM to provide a more accurate impact conclusion than that in the PEIS, which currently states a range due to the fact that this forest impact is unknown.
	AMMM Measures. Includes post-construction monitoring; injured or dead bat reporting; and measures to use best available technology and to adjust project design to minimize impacts on bat habitat.	**AMMM Measures.** The lessees could provide details to support the measures that BOEM is proposing under Alternative C. For example, the lessees could provide specific information on what equipment, technology, and best practices would be used to limit and reduce noise or other impacts (MUL-5, MUL-23).
Section 3.5.2, Benthic Resources	**Affected Environment.** Provides a regional overview of the benthic resources present within the geographic analysis area. Data are gathered from publicly available information such as the Northeast Ocean Data Portal, the U.S. Geological Survey's (USGS's) SEABED database, seabed topography, habitat mapping, BOEM NEPA documents and environmental studies, scientific papers, and other COPs.	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the benthic resources affected environment characterization in the PEIS. However, the COP-specific NEPA will need to characterize the specific benthic resources and habitats within the lease area (including along interarray cable routes) and along the offshore export cable routes, including acquiring benthic grab sampling and seafloor imagery consistent with BOEM's Benthic Habitat Survey Information Guidelines. This benthic information combined with multibeam and side scan sonar data would allow for accurate mapping and characterization of sediment types, benthic communities, and habitat types within the project area. These surveys could also include characterization and delineation of any submerged aquatic vegetation suspected to occur within nearshore and inshore project areas within export cable routes.
	Impact Analysis. Provides qualitative discussion of the typical types of impacts on benthic habitat from offshore wind developed based on the RPDE.	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference the qualitative impact analysis in the PEIS. The COP-specific NEPA analysis would need to include a quantitative impact analysis that includes the calculation of benthic habitats (acres) disturbed by each of the offshore activities associated by relevant IPFs (e.g., anchoring, cable emplacement, and presence of structures) associated with the offshore project area as well as any other project-specific analysis and modeling done (e.g., sediment transport modeling, electromagnetic fields emissions).
	AMMM Measures. Includes avoidance of boulders and minimization of boulder relocation distance to reduce alteration of the seabed; scour protection performance monitoring; submittal and approval of an anchoring plan to reduce or avoid	**AMMM Measures.** The COP-specific NEPA analysis would include the recommended benthic resource AMMM measures specific to the project location.

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
	impacts from turbidity and anchor placement; restoring berms to match natural contours; use of specific cable protection measures within complex hardbottom habitat to reduce impacts from cable emplacement on benthic resources; use of electrical shielding to control the intensity of electromagnetic fields (EMF); post-storm event monitoring; and employment of methods to minimize sediment disturbance.	
Section 3.5.3, Birds	**Affected Environment.** In the offshore environment, existing literature, modeling, and tracking information is used to describe bird species, abundance, and populations in the geographic analysis area. Bird information specific to the NY Bight lease areas is based on NYSERDA aerial digital surveys conducted between 2018 and 2019, and two NYSERDA meteorological buoys deployed in two of the NY Bight lease areas. Bird descriptions in the coastal onshore environment are very high level with little information on specific species or abundance due to unknown location of onshore project elements.	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the bird affected environment characterization in the PEIS for the offshore environment only. For the onshore environment, the COP-specific NEPA analysis will need to characterize habitats specifically in all areas where onshore components could be sited, including the offshore export cable landing(s), onshore export cable routes, POIs, substations, O&M facilities, ports, above ground transmission lines, or any other infrastructure proposed in the onshore environment that will support the project. The information should include a description of the habitat types and amounts (e.g., acreages) in the onshore project study area, as well as identifying and describing any special habitat areas that are important to birds (e.g., sandy/dune beaches). At a minimum, an on-the-ground reconnaissance level field survey is recommended in order to map habitat types at the onshore project components, including along all onshore export cable routes.
	Impact Analysis. In the offshore environment, the impact analysis is largely qualitative for the IPFs assessed. The presence of structures IPF analysis does provide a conservative estimate of bird strike mortalities based on onshore wind farm data (where bird numbers are much higher). However, because current information shows bird abundance in the offshore environment to be low, BOEM anticipates the exposure to any of the IPFs in the offshore environment to also be low, and, therefore, impacts on birds in the offshore environment are not anticipated to have any notable effect on bird populations. In the onshore environment, the impact assessment is qualitative and largely focuses on the land disturbance IPF. Because the types and locations of onshore project components are not known, there could be a range of impacts that are dependent upon the type and amount of habitat that could be altered or removed. While BOEM anticipates that bird habitat impacts in the onshore environment would be minimal due to likely siting of project components in already disturbed areas	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference the qualitative impact analysis in the PEIS for the offshore environment. Because current information indicates low bird presence in the offshore environment, offshore development for the NY Bight lease areas would not be likely to have different impacts than those described in the PEIS. For the presence of structures IPF, an estimate of bird mortality can be calculated with the number of wind turbine generators (WTGs) that are proposed for a specific lease area, but it will likely not change the ultimate impact assessment. In the onshore environment, the COP-specific NEPA analysis can incorporate by reference some of the qualitative impact analyses (e.g., noise, traffic [aircraft]). However, quantitative information is needed to address potential impacts to bird habitat (e.g., forest areas, sand/dune beach). Ideally, the habitat areas mapped for the Affected Environment (see above) along with the potential locations of all onshore project components, would allow for a quantitative assessment of habitat impacts. Habitat impacts should also differentiate between permanent (complete removal or conversion) and temporary impacts (e.g., cable placed in herbaceous areas that would regrow). This information would allow BOEM to

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
	(based on recent wind projects BOEM is reviewing), it is still possible that areas of higher quality habitat (e.g., forest) would be altered or removed. Therefore, BOEM cannot rule out more substantial bird habitat impacts without project-specific information.	provide a more accurate impact conclusion than that in the PEIS, which currently states a range due to the fact that this impact is unknown.
	AMMM Measures. Includes post-construction monitoring, dead or injured bird reporting, bird perching deterrents, measures to minimize light, compensatory mitigation for Endangered Species Act (ESA) listed birds; and measures to adjust project design to minimize impacts on bird habitat.	**AMMM Measures.** The lessees could provide details to support the measures that BOEM is proposing under Alternative C. For example, the lessees could provide specific information on what equipment, technology, and best practices would be used to limit and reduce noise or other impacts (MUL-5, MUL-23).
Section 3.5.4, Coastal Habitat and Fauna	**Affected Environment.** Provides a regional overview of the coastal habitat and fauna present within the geographic analysis area. Data are gathered from publicly available information such as BOEM NEPA documents and environmental studies, scientific papers, and other COPs.	**Affected Environment.** Because the description of coastal habitat and fauna in the PEIS is regional, the COP-specific NEPA analysis will need to characterize specific coastal habitat and fauna within the onshore project areas based upon the location of onshore components. This characterization could include reconnaissance-level habitat and species surveys at the cable landfalls, onshore export cable routes, onshore substations, and POIs. Targeted habitat and species surveys would allow for accurate identification of beach nesting birds and sea turtles as well as ESA flowering plants within coastal habitats.
	Impact Analysis. Provides qualitative analysis of impacts on overall coastal habitat and fauna by IPF (e.g., accidental releases, noise, land disturbance, and traffic) based on the RPDE.	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference some of the qualitative impact analysis about the typical impacts from offshore wind development, and discuss any differences based upon project-specific details. However, because the analysis in the PEIS is regional, a more focused project-specific analysis will be needed based on the specific habitat types and flora and fauna present in the project area. The COP-specific NEPA analysis would need to include a quantitative impact analysis that includes the calculation of coastal areas (acres) disturbed by each of the onshore activities associated by relevant IPFs (e.g., cable emplacement and land disturbance). Ideally, the habitat areas mapped for the Affected Environment (see above) along with the potential locations of all onshore project components, would allow for a quantitative assessment of habitat impacts.
	AMMM Measures. Includes using both intra and interregional shared transmission infrastructure when possible; adjusting project design to minimize impacts; using technology and best practices to minimize noise and other impacts; and environmental monitoring.	**AMMM Measures.** The COP-specific NEPA analysis would include the recommended coastal habitat and fauna AMMM measures specific to the project location.
Section 3.5.5, Finfish, Invertebrates,	**Affected Environment.** Provides a regional overview of the finfish, invertebrates, and essential fish habitat (EFH) present within the geographic analysis area. Data are gathered from publicly available information such as the Marine Cadastre,	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the finfish, invertebrates, and EFH affected environment characterization in the PEIS. However, the COP-specific NEPA analysis will need to characterize finfish, invertebrates, and EFH within the project lease area

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
and Essential Fish Habitat	Northeast Ocean Data Portal, National Oceanic and Atmospheric Administration (NOAA) Essential Fish Habitat Mapper, BOEM NEPA documents and environmental studies, scientific papers, and other COPs.	(including along interarray cable routes) and along the offshore export cable routes, including acquiring benthic grab sampling and seafloor imagery consistent with BOEM's Benthic Habitat Survey Information Guidelines. This benthic information combined with multibeam, and side scan sonar data would allow for accurate mapping and characterization of fish habitat types within the project area. In addition, any information on finfish from otter trawl surveys, gillnet or trammel net surveys, beam trawl surveys, fixed gear surveys with ventless traps, and shellfish surveys can inform this resource within the project area.
	Impact Analysis. Provides qualitative analysis of impacts on finfish, invertebrates, and EFH by IPF (e.g., cable emplacement, EMF, noise, and presence of structures) based on the RPDE.	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference the qualitative impact analysis in the PEIS and discuss any differences based upon project-specific details. The COP-specific NEPA analysis would need to include a quantitative impact analysis that includes the calculation of finfish, invertebrates, and EFH (acres) disturbed by each of the offshore activities associated by relevant IPFs (e.g., anchoring, cable emplacement, and presence of structures).
	AMMM Measures. Includes avoidance of boulders and minimization of boulder relocation distance to reduce alteration of the seabed; scour protection performance monitoring; implementation of measures to minimize noise impacts; submittal and approval of an anchoring plan to reduce or avoid impacts from turbidity and anchor placement; restoring berms to match natural contours; incorporation of ecological design elements where practicable; monitoring of cables after installation; use of electrical shielding to control the intensity of EMF to reduce impacts on sensitive species or their prey; implementation of post-storm event monitoring; developing an adaptive management plan for National Marine Fisheries Service (NMFS) trust resources to address unanticipated issues; and employing methods to minimize sediment disturbance.	**AMMM Measures.** The COP-specific NEPA analysis would include the recommended finfish, invertebrates, and EFH AMMM measures specific to the project.
Section 3.5.6, Marine Mammals	**Affected Environment.** Provides a regional overview of the marine mammals present within the geographic analysis area. Data are gathered from publicly available information such as the Marine Cadastre, Northeast Ocean Data Portal, NMFS stock assessment reports, Atlantic Marine Assessment Program for Protected Species (AMAPPS), habitat-based density models, regional digital aerial baseline marine wildlife surveys, BOEM NEPA documents and environmental studies, scientific papers, and other COPs.	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the regional marine mammal affected environment characterization in the PEIS. However, the COP-specific NEPA analysis will need to characterize the occurrence of marine mammals within the lease area and along the offshore export cable routes, including implementing surveys consistent with BOEM's Marine Mammals and Sea Turtles Information Guidelines. These surveys could include seasonal vessel-based and aerial surveys for determining spatial temporal distribution and abundance of marine mammal species and Passive Acoustic Monitoring (PAM) to gather ambient sound and presence of vocalizing marine mammals.

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
	Impact Analysis. Provides qualitative analysis of impacts on marine mammals by IPF (e.g., noise, presence of structures, and traffic) based on the RPDE.	**Impact Analysis.** The COP-specific NEPA analysis would need to include a qualitative and quantitative impact analysis that includes the specific characterization of the intensity, geographic extent, frequency, and likelihood of impacts on marine mammals associated with each of the offshore activities associated by relevant IPFs (e.g., noise, presence of structures, and traffic). This impact analysis for marine mammals would include results from underwater acoustic modeling from proposed activities (e.g., pile-driving, unexploded ordnance [UXO], surveys) and from using BOEM's Risk Assessment to Model Encounter Rates Between Large Whales and Sea Turtles and Vessel Traffic from Offshore Wind Energy on the Atlantic OCS.
	AMMM Measures. Includes implementation of a PAM system to reduce the risk of vessel strike and impacts from project activities (e.g., pile-driving); submittal and approval of pile-driving monitoring plans; protected species observer (PSO) requirements; measures to minimize vessel noise; measures to limit temporal and spatial extent of noise exposure; real-time and near-real-time monitoring to inform adaptive mitigation measures; trainings; collection of baseline information used to better anticipate potential impacts and further mitigate effects on marine mammals in the future; seasonal vessel speed requirements; measures to reduce marine debris and impacts from entanglement, ingestion, and pollutants; use of electrical shielding to control the intensity of EMF to reduce impacts on sensitive species or their prey; post-storm event monitoring; and reporting of potential takes of protected species.	**AMMM Measures.** The COP-specific NEPA analysis would include the recommended marine mammal AMMM measures specific to the IPFs. It would be expected that issuance of the Incidental Harassment Authorizations or Letter of Authorizations for construction activities from NMFS would include permit conditions, including specific measures to avoid and minimize potential marine mammal impacts.
Section 3.5.7, Sea Turtles	**Affected Environment.** Provides a regional overview of the sea turtles present within the geographic analysis area. Data are gathered from publicly available information such as the Marine Cadastre, Northeast Ocean Data Portal, NMFS stock assessment reports, AMAPPS, habitat-based density models, regional digital aerial baseline marine wildlife surveys, BOEM NEPA documents and environmental studies, scientific papers, and other COPs.	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the regional sea turtle affected environment characterization in the PEIS. However, the COP-specific NEPA analysis will need to characterize the occurrence of sea turtles within the lease area and along the offshore export cable routes, including implementing surveys consistent with BOEM's Marine Mammals and Sea Turtles Information Guidelines. These surveys could include seasonal vessel-based and aerial surveys for determining spatial temporal distribution and abundance of sea turtle species. Targeted habitat and species surveys would allow for accurate identification of nesting sea turtles, if any, suspected to occur along the offshore export cable routes and at landfall sites.
	Impact Analysis. Provides qualitative analysis of impacts on sea turtles by IPF (e.g., noise, presence of structures, and traffic) based on the RPDE.	**Impact Analysis.** The COP-specific NEPA analysis would need to include a quantitative and qualitative impact analysis that includes the specific characterization of the intensity, geographic extent, frequency, and likelihood of impacts on sea turtles associated with each of the offshore activities associated

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
		by relevant IPFs (e.g., noise, presence of structures, and traffic). This impact analysis for sea turtles would include results from underwater acoustic modeling from proposed activities (e.g., pile-driving, UXO, surveys) and from using BOEM's Risk Assessment to Model Encounter Rates Between Large Whales and Sea Turtles and Vessel Traffic from Offshore Wind Energy on the Atlantic OCS.
	AMMM Measures. Includes submittal and approval of pile-driving monitoring plans; PSO requirements; measures to minimize vessel noise; measures to limit temporal and spatial extent of noise exposure; real-time and near–real-time monitoring to inform adaptive mitigation measures; trainings; collection of baseline information used to better anticipate potential impacts and further mitigate effects on marine mammals in the future; seasonal vessel speed requirements; measures to reduce marine debris and impacts from entanglement, ingestion, and pollutants; use of electrical shielding to control the intensity of EMF to reduce impacts on sensitive species or their prey; post-storm event monitoring; and reporting of potential takes of protected species.	**AMMM Measures.** The COP-specific NEPA analysis would include the recommended sea turtle AMMM measures specific to the IPFs.
Section 3.5.8, Wetlands	**Affected Environment.** Wetlands in the geographic analysis area (which is limited to the onshore environment) are described using publicly available New Jersey and New York state wetland geographic information system (GIS) layers, as well as the National Wetlands Inventory (NWI). The geographic analysis area in the PEIS is much larger than the geographic analysis area of a specific NY Bight lease area.	**Affected Environment.** The COP-specific NEPA analysis will need to characterize wetlands specifically in all areas where onshore components could be sited, including the offshore export cable landing(s), onshore export cable routes, POIs, substations, O&M facilities, ports, or any other infrastructure proposed in the onshore environment that will support the project. The information should include a description of the wetland types and acreages in the onshore project study area, as well as information on the functions the wetlands may provide. At a minimum, an on-the-ground reconnaissance level field survey should be conducted in order to map all wetlands at the onshore project components, including along all onshore export cable routes. A wetland delineation would need to be conducted per the U.S. Army Corps of Engineers' wetland delineation manual where access can be obtained.
	Impact Analysis. The wetland impact assessment is qualitative and largely focuses on the land disturbance IPF. Because the types and locations of onshore project components are not known, there could be a range of wetland impacts that are dependent upon the type and amount of wetland that could be affected. While BOEM anticipates that wetland impacts would be minimal due to likely siting of project components in already disturbed areas (based on recent wind projects BOEM is reviewing), it is still possible that wetlands would be temporarily	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference the accidental releases IPF and the applicable qualitative analysis in the land disturbance IPF. However, quantitative information is needed to address potential impacts on wetlands. Ideally, the wetlands mapped for the Affected Environment (see above) along with the potential locations of all onshore project components would allow for a quantitative assessment of wetland impacts. The quantitative wetland impact analysis should also differentiate between permanent (wetland filling or conversion) and temporary impacts. This information would allow BOEM to provide a more accurate impact conclusion

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
	or permanently altered, or permanently filled. Therefore, BOEM cannot rule out more substantial wetland impacts without project-specific information.	than that in the PEIS, which currently states a range due to the unknown locations of onshore project components and wetlands.
	AMMM Measures. Includes commitments to adjust project design and use shared transmission infrastructure to reduce impacts on wetlands.	**AMMM Measures.** While state and federal wetland permitting would include many measures to avoid and reduce wetland impacts, the lessees could provide details to support the measures that BOEM is proposing under Alternative C. For example, the lessees could specifically describe how they are using existing infrastructure or disturbed areas to reduce impact on wetlands (see MUL-18).
Section 3.6.1, Commercial Fisheries and For-Hire Recreational Fishing	**Affected Environment.** Provides a regional overview of the commercial fisheries and for-hire recreational fishing within the geographic analysis area. Data are gathered from publicly available information such as the Marine Cadastre, Northeast Ocean Data Portal, NMFS Commercial Fisheries Landings Statistics, NMFS Descriptions of Selected Fishery Landings and Estimates of Vessel Revenue from Areas, NMFS Landing and Revenue Data for Wind Energy Areas, NMFS Recreational Fisheries Statistics Queries, BOEM NEPA documents and environmental studies, scientific papers, and other COPs.	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the commercial fisheries and for-hire recreational fishing affected environment characterization in the PEIS. However, the COP-specific NEPA analysis will need to characterize commercial fisheries and for-hire recreational fishing within each lease area (including along interarray cable routes) and along the offshore export cable routes, including acquiring fishery information consistent with BOEM's Fishery Information Guidelines. This could include data from otter trawl surveys, gillnet or trammel net surveys, beam trawl surveys, fixed gear surveys with ventless traps, and shellfish surveys.
	Impact Analysis. Provides qualitative analysis of resource and socioeconomic impacts on commercial fisheries and for-hire recreational fishing by IPF (e.g., cable emplacement, EMF, noise, and presence of structures) based on the RPDE.	**Impact Analysis.** The COP-specific NEPA analysis would need to include a qualitative impact analysis that incorporates the characterization of impacts on commercial fisheries and for-hire recreational fishing associated with each of the offshore activities by relevant IPFs (e.g., cable emplacement, EMF, noise, and presence of structures). This impact analysis for commercial fisheries and for-hire recreational fishing would include the socioeconomic effects on fishing vessel maneuverability, reduction in fishing activities and fishing revenue, entanglement and damage or loss of commercial and recreational fishing gear, and an estimate of the amount of commercial fishing revenue that would be "exposed."
	AMMM Measures. Includes implementation of a gear loss and damage compensation plan to reduce negative impacts from loss of gear from seabed obstructions; implementation of a Scour and Cable Protection Plan and associated protection methods to ensure that the materials reflect the pre-existing conditions; development and execution of a monitoring plan for scallop populations compatible with other regional data collection methods; implementation of fisheries mitigation including design of static cables to minimize risk of fishery gear snags and the planning of project design to minimize space use conflicts with fisheries; adherence to BOEM's Fisheries Survey	**AMMM Measures.** The COP-specific NEPA analysis would include the recommended commercial fisheries and for-hire recreational fishing AMMM measures specific to the IPFs.

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
	Guidelines; compensation to commercial and for-hire recreational fishermen for loss of income due to unrecovered economic activity and to shoreside businesses for losses indirectly related to the expected development; post-storm event monitoring; and implementation of surveys to monitor and adaptively mitigate for lost fishing gear accumulated at WTG foundations to reduce marine debris.	
Section 3.6.2, Cultural Resources	**Affected Environment.** Provides a regional overview of the cultural context and resource types in the geographic analysis area and any knowable, individual historic properties identified in a Programmatic Area of Potential Effects (APE) developed for National Historic Preservation Act (NHPA) reviews of the six NY Bight lease areas. Data are gathered from the 2021 NY Bight Environmental Assessment and NY Bight *NHPA Section 106 Summary* (Appendix I).	**Affected Environment.** The COP-specific NEPA and NHPA analysis will need to identify and characterize cultural contexts, cultural resource types, and specific historic properties in a project-specific geographic analysis area and APE. This includes completion of associated cultural resource and historic property identification efforts per BOEM guidelines. Identification of cultural resources and historic properties would allow for accurate impact analysis and development and implementation of sufficient AMMM measures.
	Impact Analysis. Provides qualitative analysis of impacts on cultural resources overall by IPF (i.e., accidental releases, anchoring, cable emplacement and maintenance, survey gear utilization, land disturbance, lighting, and presence of structures) based on the RPDE. Qualitative analysis is supported by limited quantitative data derived from BOEM's background research on the affected environment.	**Impact Analysis.** The COP-specific NEPA and NHPA analysis would need to include both a qualitative and quantitative analysis of impacts on the specific cultural resources and historic properties identified in the project-specific geographic analysis area and APE. Impact analysis would involve NHPA consultations with State Historic Preservation Officers (SHPOs), federally recognized Tribes, lessees, and other identified consulting parties to sufficiently assess effects on historic properties identified in a COP-specific APE. Identification of and assessments of effects on historic properties are required to develop and implement sufficient AMMM measures.
	AMMM Measures. Includes requirements to establish and comply with marine cultural resource buffers, implement monitoring and post-review discovery plans for marine and terrestrial resources, avoid impacts on terrestrial archaeological resources, develop historic property treatment plans for effects on historic properties that cannot be avoided, and contribute to a compensatory mitigation fund to address impacts on historic properties.	**AMMM Measures.** The COP-specific NEPA and NHPA analysis would include sufficient AMMM measures to avoid, reduce, or resolve adverse effects on historic properties as agreed upon by federally recognized Tribes, Advisory Council on Historic Preservation (ACHP), SHPOs, lessees, and other consulting parties. The AMMM measures may include those identified in the PEIS and additional measures identified during the COP-specific NEPA and NHPA process.
Section 3.6.3, Demographics, Employment, and Economics	**Affected Environment.** Provides a county-level overview of population, housing and employment data from the U.S. Census Bureau and NOAA.	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the relevant affected environment characterization in the PEIS. While it is anticipated that the geographic analysis area of a specific NY Bight lease area would be a subset of the geographic analysis area in the PEIS, additional county-level characterization may be necessary if this is not the case. Additionally, depending on the timing of the COP-specific NEPA document, it may be warranted to provide more recent data than what is provided in the PEIS. More

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
		detailed community-level characterizations of populations with the potential to be affected by specific landings or cable routes, POIs, O&M facilities, or port utilization will be warranted in the COP-specific NEPA analysis.
	Impact Analysis. Provides qualitative analysis of impacts and benefits of development of offshore wind projects on populations, employment, and the economy based on the RPDE.	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference the qualitative impact analysis in the PEIS. This analysis should focus on what is unique about the project and how it is different from what is discussed in the PEIS. Additionally, an economic analysis using quantitative modeling is warranted to support the COP-specific NEPA analysis. This analysis would provide: • Estimates of direct, indirect, induced jobs by project phase during construction and operations. • Estimates of economic benefits (Gross Domestic Product) generated by project phase during construction and operations. • Estimate of local expenditures during construction and operations. • Estimates of economic benefits associated with tax revenue (local, state, and federal) during construction.
	AMMM Measures. No AMMM measures specific to demographics, employment, and economics are included in the PEIS.	**AMMM Measures.** If applicable, the analysis should provide descriptions of any local commitments or investments in workforce training and development to support the offshore wind industry.
Section 3.6.4, Environmental Justice	**Affected Environment.** Provides a county-level overview of low-income and minority populations in the geographic analysis area based on data from the U.S. Census Bureau. Provides county-level mapping of the commercial and recreational fishing engagement or reliance of coastal communities based on NOAA's social indicator tool and provides a description of the social stressors experienced by low-income or minority populations in coastal communities. Identifies tribal communities within the geographic analysis area.	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the relevant affected environment characterization in the PEIS. While it is anticipated that the geographic analysis area of a specific NY Bight lease area would be a subset of the geographic analysis area in the PEIS, additional county-level characterization may be necessary if this is not the case. Additionally, depending on the timing of the COP-specific NEPA document, it may be warranted to provide more recent data than what is provided in the PEIS. More detailed community-level characterizations of low-income and minority populations with the potential to be affected by specific landings or cable routes, POIs, O&M facilities, or port utilization will be necessary for the COP-specific NEPA analysis.
	Impact Analysis. Provides qualitative analysis of impacts and benefits of development of offshore wind projects on environmental justice populations based on the RPDE.	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference the qualitative impact analysis in the PEIS. The analysis should focus on what is unique about the project and how it is different from what is discussed in the PEIS. Site-specific analysis of the project impacts on environmental justice populations in areas surrounding ports, cable landings, substations, onshore construction, O&M facilities, or any other infrastructure proposed in the onshore environment that will support the project will be necessary for the COP-specific NEPA analysis. The analysis will incorporate more detailed impact analyses by resource topic (e.g., project-level air quality assessments for environmental

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
		justice populations affected by the project). The COP-specific NEPA analysis will analyze and provide a determination as to whether the project has disproportionately high and adverse human health or environmental effects on low-income and minority populations when compared to the project's effect on the overall population.
	AMMM Measures. Includes an environmental justice communications plan, an environmental justice mitigation resources plan, regular progress reporting on these plans, and a compensatory mitigation fund to address impacts on environmental justice populations that have not been addressed through other mitigation measures.	**AMMM Measures.** The environmental justice AMMM measures will be further defined during the COP-specific NEPA review. For example, whether any impacts are identified that cannot otherwise be mitigated, the specific impacts targeted for mitigation by the compensatory mitigation fund, and the amount contributed to the compensatory mitigation fund would be determined by BOEM, in coordination with the NY Bight lessee, during COP-specific NEPA review and updated, as appropriate, during construction and operations.
Section 3.6.5, Land Use and Coastal Infrastructure	**Affected Environment.** Provides a regional overview of the potentially affected onshore areas, the areas where representative ports are located, and the areas closest to the NY Bight lease areas that may be affected by construction and O&M.	**Affected Environment.** Site-specific level characterizations of land use and coastal infrastructure (e.g., zoning, county/municipal-level plans) in areas surrounding ports, cable landings, substations, onshore construction, O&M facilities, or any other infrastructure proposed in the onshore environment that will support the project will be warranted with COP-specific NEPA analysis.
	Impact Analysis. Provides a qualitative analysis of the typical impacts and benefits associated with onshore development of offshore wind projects on land use and coastal infrastructure such as port improvement and expansion, vehicle traffic, and visibility of offshore structures. Because the location of onshore infrastructure is not yet known, the analysis is general and not location specific.	**Impact Analysis.** Site-specific analysis of project impacts on land use and coastal infrastructure in areas surrounding ports, cable landings, substations, onshore construction, O&M facilities or any other infrastructure proposed in the onshore environment that will support the project will be necessary for the COP-specific NEPA analysis. For example, the analysis will need to describe the specific locations that would be affected, the acreage of disturbance, and consistency with local zoning and other ordinances (e.g., noise requirements).
	AMMM Measures. Includes notifying residents of construction activities, construction outside of summer months, and use of best available technology to limit noise.	**AMMM Measures.** The lessees could provide details to support the measures that BOEM is proposing under Alternative C. For example, the lessees could provide specific information on what equipment, technology, and best practices would be used to limit and reduce noise.
3.6.6, Navigation and Vessel Traffic	**Affected Environment.** Provides an overview of the current navigational setting for shipping and other maritime users in the geographic analysis area, including shipping channels, traffic schemes and fairways, and historical vessel traffic volumes within each NY Bight lease area based on 3 years of Automatic Identification System data.	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the relevant affected environment characterization in the PEIS. While the geographic analysis area of a specific NY Bight lease would be a subset of the geographic analysis area in the PEIS, additional characterization may be necessary depending on the location of export cable routes and the location of ports to be used by the projects. Information from the COP-specific Navigation Safety Risk Assessment can be used to supplement the information in the PEIS related to vessel traffic and safety (e.g., search and rescue incident data, accident frequency data).
	Impact Analysis. Provides a qualitative analysis of the impacts associated with the development of the NY Bight projects based	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference the qualitative impact analysis in the PEIS. The additional analysis should focus

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
	on the location of the lease areas, including impacts from structures, increased vessel traffic, and cable placement. Analysis uses information from COPs of nearby projects to quantitatively estimate project vessel traffic and projected increases in accident frequencies.	on what is unique about the project and how it is different from what is discussed in the PEIS based on the site-specific location, project details, and the assessment provided in the Navigation Safety Risk Assessment. The analysis should provide additional discussion regarding the following project-specific details: • Anchoring plans. • Navigation Safety Risk Assessment analysis results of the potential increases in accident frequencies. • Cable route locations and construction methods and timing. • Port utilization. • Number of WTG/OSS, spacing/layout, and construction methods and timing. • Project vessel traffic.
	AMMM Measures. Includes boulder relocation reporting, using shared transmission infrastructure when possible, using grid patterns and avoidance measures that minimize navigation hazards, increasing spacing between structures, and communicating effectively with affected entities.	**AMMM Measures.** The lessees could provide details to support the measures that BOEM is proposing under Alternative C. For example, the lessees could provide details regarding the proposed shared transmission infrastructure.
3.6.7, Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research and Surveys)	**Affected Environment.** Provides an overview of the current marine minerals extraction, national security and military use, aviation and air traffic, cables and pipelines, radar systems, and scientific research and surveys in the geographic analysis area. Data are gathered from publicly available information from the Marine Minerals Information System, Mid-Atlantic Regional Council on the Ocean, and Northeast Regional Ocean Council.	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the relevant affected environment characterization in the PEIS. While it is anticipated that the geographic analysis area of a specific NY Bight lease area would be a subset of the geographic analysis area in the PEIS, additional site-specific characterization may be necessary, especially regarding proposed offshore export cable routes and landfall locations. Site-specific characterization of other uses potentially affected by existing cables, national security and military uses, radar systems, and scientific research and surveys in the vicinity of the geographic analysis area will be warranted with COP-specific NEPA analysis.
	Impact Analysis. Provides an analysis of the impacts associated with the development of offshore wind projects on other uses, including accessibility of marine mineral borrow areas, navigational traffic, and radar interference.	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference the impact analysis in the other uses section of the PEIS. This analysis should focus on what is unique about the project and how it is different from what is discussed in the PEIS. For example, the analysis should include a discussion of impacts from cable routes and a quantitative assessment of the potential interference of WTGs with radar systems, national security and military uses, and scientific research and surveys.
	AMMM Measures. Includes operational modifications and mitigation agreements for radar systems, infrastructure removal at decommissioning, survey mitigation agreement between NMFS and lessee, and coordination agreements to reduce long-term impacts on marine mineral extraction.	**AMMM Measures.** If applicable, the lessees should provide descriptions of any planned crossings of existing cables and pipelines, and use of best practices or available technology to mitigate or decrease radar interference and avoid or minimize impacts on marine mineral resources.

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
3.6.8, Recreation and Tourism	**Affected Environment.** Provides a county-level description of recreation and tourism and recreational fishing activities in the geographic analysis area based on data from NOAA and other state and local sources.	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the recreation and tourism affected environment characterization in the PEIS. However, the COP-specific NEPA analysis will need to characterize recreation and tourism and recreational fishing within the lease area (including along interarray cable routes), along the offshore export cable routes, and in areas surrounding cable landings, substations, onshore construction, O&M facilities, or any other infrastructure proposed in the onshore environment.
	Impact Analysis. Provides qualitative analysis of impacts and benefits of development of offshore wind projects on recreation and tourism and recreational fishing based on the RPDE.	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference the qualitative impact analysis in the PEIS. The analysis should focus on what is unique about the project and how it is different from what is discussed in the PEIS. Site-specific analysis of the project impacts on recreation and tourism and recreational fishing activities in the lease area, along the offshore export cable routes, and in areas surrounding cable landings, substations, onshore construction, O&M facilities, or any other infrastructure proposed in the onshore environment that will support the project will be necessary for the COP-specific NEPA analysis.
	AMMM Measures. Includes measures to minimize nighttime lighting associated with aviation obstruction lights; scheduling nearshore construction activities outside of the summer months to avoid tourist season; and use of equipment, technology, and best practices to reduce noise impacts.	**AMMM Measures.** The lessees could provide details to support the measures that BOEM is proposing under Alternative C. For example, the lessees could provide specific information on what equipment, technology, and best practices would be used to limit and reduce noise.
3.6.9, Scenic and Visual Resources	**Affected Environment.** Provides mapping and descriptions of seascape character area, open ocean character area, and landscape character area and key observation points.	**Affected Environment.** The COP-specific NEPA analysis can incorporate by reference the relevant affected environment characterization in the PEIS for the offshore environment. The COP-specific NEPA analysis would incorporate additional mapping and descriptions of seascape character area, open ocean character area, and landscape character area and key observation points developed specifically for the COP. The COP-specific NEPA analysis would need to provide location-specific characterization of the onshore environment based upon where the proposed landfalls, onshore cable routes, substations, and O&M facilities would be sited.
	Impact Analysis. Provides mapping and descriptions of project viewsheds for each of the six lease areas and for the six lease areas combined and presents impacts on seascape character area, open ocean character area, and landscape character area and key observation points from offshore structures. Impacts from onshore infrastructure are discussed qualitatively and are not location specific.	**Impact Analysis.** The COP-specific NEPA analysis can incorporate by reference the analysis of impacts on seascape character area, open ocean character area, and landscape character area and key observation points by lease area from offshore structures. The analysis should describe how the impacts would differ from those in the PEIS based on different turbine heights and layout and may include project-specific visual simulations. For the onshore environment, the COP-specific NEPA analysis would need to assess impacts on landscape character area and key observation points from onshore facilities, such as substations.

PEIS Section	Overview of Programmatic EIS Content	Additional Analysis for COP-Specific NEPA Analysis
	AMMM Measures. Includes measures to minimize nighttime lighting associated with aviation obstruction lights and measures to minimize visual contrast with onshore infrastructure.	**AMMM Measures.** The COP-specific NEPA analysis may include other project-specific measures to minimize visual effects.

Appendix D: Planned Activities Scenario

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D.1 Ongoing and Planned Activities Scenario

This appendix describes the other ongoing and planned activities that could occur within the geographic analysis area for each resource and potentially contribute to baseline conditions and trends for resources considered in the Draft Programmatic Environmental Impact Statement (PEIS). The baseline conditions and trends described here serve as the basis for analysis of the No Action Alternative and cumulative impacts. The analysis of the action alternatives includes the potential biological, socioeconomic, physical, and cultural impacts that could result from wind energy development activities in the six New York Bight (NY Bight) lease areas, as well as the change in those impacts that could result from adopting programmatic avoidance, minimization, mitigation, and monitoring (AMMM) measures for the NY Bight lease areas.

The geographic analysis area varies for each resource as described in the individual resource sections of Chapter 3, *Affected Environment and Environmental Consequences*. Impacts could occur from the start of construction of the NY Bight projects through decommissioning. The Bureau of Ocean Energy Management (BOEM) anticipates that construction of the NY Bight projects would begin between 2026 and 2030. The decommissioning phase is anticipated to be around 35 years after construction is completed. 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 NY Bight projects. 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 six NY Bight projects 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 (nm) are referred to by name.

D.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 geographic analysis area for each resource topic analyzed in the Draft PEIS. Projects or actions that are considered speculative per the definition provided in 43 Code of Federal Regulations (CFR) 46.30[1] are noted in subsequent tables but excluded from the cumulative impact analysis in Chapter 3.

Ongoing and planned activities and environmental stressors described in this section consist of: (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) dredging and port improvement projects; (5) marine minerals use and ocean-dredged material disposal; (6) military use; (7) marine transportation; (8) fisheries use, management, and monitoring surveys; (9) global climate change; (10) oil and gas activities; and (11) onshore development activities.

BOEM analyzed the possible extent of other planned offshore wind energy development activities on the Atlantic Outer Continental Shelf (OCS) to determine reasonably foreseeable cumulative effects measured by installed power capacity. Table D2-1 in Attachment D2 represents the status of projects as of November 2023. The methodology for developing the planned activities scenario is the same as for the Vineyard Wind 1 (OCS-A 0501) project and details of the scenario development are described in the Vineyard Wind 1 Final Environmental Impact Statement (EIS) (BOEM 2021a).

D.2.1 Offshore Wind Energy Development Activities

D.2.1.1 Site Characterization Studies

A lessee is required to provide the results of site characterization activities with its site assessment plan (SAP)[2] and Construction and Operations Plan (COP). For the purposes of the cumulative impact analysis, BOEM makes the following assumptions, which represent the maximum-case scenario for survey and sampling activities:

- 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 their lease areas during the 5-year site assessment term to collect required geophysical information for siting of a meteorological tower, two buoys, and

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[1] 43 CFR 46.30 – Reasonably foreseeable planned 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 planned actions do not include those actions that are highly speculative or indefinite.

[2] On January 30, 2023, BOEM released a Notice of Proposed Rulemaking (NPRM) for its Renewable Energy Modernization Rule, which among other things proposed the elimination of the site assessment plan requirement for met buoys, which are most commonly used for site assessment activities. However, met buoys would continue to require U.S. Army Corps of Engineers (USACE) permits given the USACE's jurisdiction over obstructions deployed in U.S. navigable waters under Section 10 of the Rivers and Harbors Act.

commercial facilities (wind turbines). The surveys may be completed in phases, with the meteorological tower and buoy areas likely to be surveyed first.

- Lessees 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 D-1 describes the typical site characterization surveys, the types of equipment and method used, and which resources the survey information would inform.

Table D-1. Site characterization survey assumptions[1]

Survey Type	Survey Equipment and Method	Resource Surveyed or Information Used to Inform
HRG surveys	Side-scan sonar, sub-bottom profiler, magnetometer, multi-beam echosounder	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	Bats
	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] The January 30, 2023 NPRM defers and extends the required time periods for meeting certain geotechnical survey requirements, such as engineering site-specific surveys (e.g., boreholes, vibracores, grab samplers, cone penetrometer tests, and other penetrative methods), until after COP approval but before construction. The comment period for this NPRM ended on May 1, 2023. BOEM is reviewing all comments and then will revise the proposed rule as needed and issue a Final Rule.

D.2.1.2 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 buoys. Meteorological buoys have become the preferred meteorological and oceanographic (metocean) data collection platform for developers, and BOEM expects that most future site assessments will 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 on the OCS consisting of one to three meteorological buoys per SAP (Table D2-1 in Attachment D2). Site assessment would likely take place starting within 1 to 2 years of lease execution, because preparation of a SAP (and subsequent BOEM review) takes time. The No Action Alternative and cumulative analyses consider these site assessment activities.

D.2.1.3 Construction and Operation of Offshore Wind Facilities

Table D-2 depicts construction of offshore wind projects from Maine to South Carolina.[3] Also included are all the projects currently in various stages of planning within BOEM's offshore leases from Massachusetts to South Carolina. Projected construction dates for each offshore wind project are listed in Table D2-1 in Attachment D2, and each project will require a National Environmental Policy Act (NEPA) process with an EIS or environmental assessment prior to approval.

Table D-2 summarizes (1) the incremental number of construction locations that are projected to be active in each region during each year between 2023 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.

BOEM assumes planned offshore wind projects will include the same or similar components as the NY Bight projects: wind turbine generators (WTGs), offshore and onshore cable systems, offshore substations (OSSs), onshore operations and maintenance (O&M) facilities, and onshore interconnection facilities. BOEM further assumes that other planned offshore wind projects will employ the same or similar construction and installation, O&M, and conceptual decommissioning activities as the NY Bight projects. However, 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 analysis of ongoing and planned activities, the ongoing and planned projects included in Table D2-1 in Attachment D2 are analyzed in Chapter 3 of the Draft PEIS.

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[3] Within this Draft PEIS, BOEM analyzes Ocean Wind 1 (OCS-A 0498) as an ongoing offshore wind project and Ocean Wind 2 (OCS-A 0532) as a planned offshore wind project. On October 31, 2023, Orsted publicly announced their decision to cease development of Ocean Wind 1 and Ocean Wind 2. However, Ocean Wind LLC (the lessee for Ocean Wind 1) has not withdrawn their COP for lease OCS-A 0498, and so BOEM has analyzed the project as described in the approved COP. Orsted North America Inc. (the lessee for Ocean Wind 2) has not relinquished or reassigned lease OCS-A 0532; therefore, BOEM has analyzed development of the lease area consistent with the assumptions identified in this appendix.

Table D-2. Offshore wind project construction schedule (dates shown as of November 2023)

Project/Region	Number of Foundations										
	Before 2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 and Beyond
NE Aqua Ventus (Maine state waters)	-	-	-	-	2	-	-	-	-	-	-
Total Other State Waters Projects	-	-	-	-	2	-	-	-	-	-	-
Estimated Other State Waters Construction Total	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**
Estimated O&M Total	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**2**	**2**	**2**	**2**
EXISTING AND ONGOING PROJECTS											
Block Island (Rhode Island state waters)	5	-	-	-	-	-	-	-	-	-	-
Vineyard Wind 1, part of OCS-A 0501	-	-	-	63	-	-	-	-	-	-	-
South Fork Wind, OCS-A 0517	-	-	-	13	-	-	-	-	-	-	-
CVOW-Pilot, OCS-A 0497	2	-	-	-	-	-	-	-	-	-	-
Revolution Wind, part of OCS-A 0486	-	-	-	102		-	-	-	-	-	-
Ocean Wind 1, OCS-A 0498	-	-	-	-	101		-	-	-	-	-
Estimated Existing and Ongoing Project Construction Total	**7**	**0**	**0**	**178**	**101**	**0**	**0**	**0**	**0**	**0**	**0**
Estimated O&M Total	**7**	**7**	**7**	**7**	**185**	**286**	**286**	**286**	**286**	**286**	**286**
PLANNED PROJECTS											
Massachusetts/Rhode Island Region											
Sunrise Wind, OCS-A 0487	-	-	-	-	95	-	-	-	-	-	-
New England Wind, OCS-A 0534 and portion of OCS-A 0501 remainder (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])	-	-	-	-	-	66		-	-	-	-
SouthCoast Wind, OCS-A 0521	-	-	-	-	-	149					
Beacon Wind 1, part of OCS-A 0520	-	-	-	-	78					-	-
Beacon Wind 2, part of OCS-A 0520	-	-	-	-	-	79					-
Bay State Wind, part of OCS-A 0500	-	-	-	-	-	96					
OCS-A 0500 remainder	-	-	-	-	-	119					
OCS-A 0487 remainder	-	-	-	-	-						

<table>
<tr><th rowspan="2">Project/Region</th><th colspan="11">Number of Foundations</th></tr>
<tr><th>Before 2021</th><th>2021</th><th>2022</th><th>2023</th><th>2024</th><th>2025</th><th>2026</th><th>2027</th><th>2028</th><th>2029</th><th>2030 and Beyond</th></tr>
<tr><td>Vineyard Wind NE, OCS-A 0522</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">160</td></tr>
<tr><td>Estimated Annual Massachusetts/Rhode Island Construction</td><td>0</td><td>0</td><td>0</td><td>0</td><td>237</td><td>509</td><td>160</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Estimated O&M Total</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>237</td><td>746</td><td>906</td><td>906</td><td>906</td><td>906</td></tr>
<tr><td colspan="12">New York/New Jersey Region</td></tr>
<tr><td>Atlantic Shores South, OCS-A 0499</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>11</td><td colspan="2">200</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Atlantic Shores North, OCS-A 0549</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">165</td></tr>
<tr><td>Ocean Wind 2, OCS-A 0532</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">111</td></tr>
<tr><td>Empire Wind 1, part of OCS-A 0512</td><td>-</td><td>-</td><td>-</td><td colspan="4">58</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Empire Wind 2, part of OCS-A 0512</td><td>-</td><td>-</td><td>-</td><td colspan="5">91</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>NY Bight lease areas (OCS-A 0537, OCS-A 0538, OCS-A 0539, OCS-A 0541, OCS-A 0542, and OCS-A 0544) [1]</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">1,125</td></tr>
<tr><td>Estimated New York/New Jersey Construction</td><td>0</td><td>0</td><td>0</td><td>149</td><td>0</td><td>11</td><td>1,601</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Estimated O&M Total</td><td>0</td><td>0</td><td>0</td><td>0</td><td>149</td><td>149</td><td>160</td><td>1,761</td><td>1,761</td><td>1,761</td><td>1,761</td></tr>
<tr><td colspan="12">Delaware/Maryland Region</td></tr>
<tr><td>Skipjack, OCS-A 0519</td><td>-</td><td>-</td><td>-</td><td>-</td><td>17</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>US Wind/Maryland Offshore Wind, OCS-A 0490</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="4">125</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>GSOE I, OCS-A 0482</td><td>-</td><td>-</td><td>-</td><td colspan="8" rowspan="2">96</td></tr>
<tr><td>OCS-A 0519 remainder</td><td></td><td></td><td></td></tr>
<tr><td>Estimated Delaware/Maryland Construction</td><td>0</td><td>0</td><td>0</td><td>96</td><td>142</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Estimated O&M Total</td><td>0</td><td>0</td><td>0</td><td>0</td><td>96</td><td>238</td><td>238</td><td>238</td><td>238</td><td>238</td><td>238</td></tr>
<tr><td colspan="12">South Atlantic Region</td></tr>
<tr><td>CVOW-Commercial, OCS-A 0483</td><td>-</td><td>-</td><td>-</td><td colspan="5">205</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Kitty Hawk North, OCS-A 0508</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="4">70</td></tr>
<tr><td>Kitty Hawk South, OCS-A 0508</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="3">123</td></tr>
<tr><td>TotalEnergies Renewables Wind, OCS-A 0545</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">65</td></tr>
<tr><td>Duke Energy Renewables Wind, OCS-A 0546</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="5">65</td></tr>
<tr><td>Estimated Annual South Atlantic Construction Total</td><td>0</td><td>0</td><td>0</td><td>205</td><td>0</td><td>0</td><td>130</td><td>70</td><td>123</td><td>0</td><td>0</td></tr>
</table>

Project/Region	Number of Foundations Before 2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 and Beyond
Estimated O&M Total	**0**	**0**	**0**	**0**	**205**	**205**	**205**	**335**	**405**	**528**	**528**
Total											
Estimated Total Construction	**7**	**0**	**0**	**628**	**482**	**520**	**1,891**	**70**	**123**	**0**	**0**
Estimated O&M Total	**7**	**7**	**7**	**7**	**635**	**1,117**	**1,637**	**3,528**	**3,598**	**3,721**	**3,721**

[1] Total foundations are the anticipated number of WTG and OSS across all six NY Bight lease areas provided by the lessees. These are estimates used for analysis purposes only and do not reflect the actual number of foundations that may be constructed in each NY Bight lease area.
CVOW = Coastal Virginia Offshore Wind; GSOE = Garden State Offshore Energy; NE = Northeast

D.2.2 Incorporation by Reference of Cumulative Impacts Study and the Analyses Therein

BOEM has completed a study of Impact-Producing Factors (IPFs) on the North Atlantic OCS to consider in an offshore wind development cumulative impacts scenario (BOEM 2019). The study is incorporated in this document 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, and identifies the types of actions and activities to be considered in a cumulative impacts scenario. These IPFs and their relationships were used in the Draft PEIS analysis of cumulative impacts, and BOEM decided which IPF applied to which resource. 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.

As discussed in the BOEM (2019) study, reasonably foreseeable activities other than offshore wind projects may also affect the same resources as the six NY Bight projects 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 NY Bight projects.

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

There are 27 submarine telecommunication cables (18 active and 9 out of service) within the vicinity of the NY Bight lease areas. National Oceanic and Atmospheric Administration (NOAA) nautical charts identify multiple sewer pipelines, stormwater outfalls, and intake structures along the coast of New Jersey and New York that begin onshore and extend offshore. The New York State Energy Research and Development Authority (NYSERDA) identified 21 potential onshore points of interconnection for planned offshore wind cables to interconnect to the existing New York State transmission grid (NYSERDA 2017).

There are six in-service pipelines within the vicinity of the NY Bight lease areas. The Williams Transco pipeline, which supplies a significant amount of natural gas to New York, is located in the nearshore waters between New Jersey and New York (NYSERDA 2017). A gas pipeline is buried in the northern New York Harbor utility corridor, two gas pipelines and one petroleum product pipeline are buried in the southern New York Harbor utility corridor, and the deeply tunneled replacement Brooklyn-Staten Island water siphon in the New Jersey Harbor.

The New Jersey state Board of Public Utilities (BPU) approved the Larrabee Tri-Collection Station proposed by Mid-Atlantic Offshore Development and developers Shell New Energies and EDF Renewables North America. The New Jersey State Agreement Approach (SAA) Board order was awarded to the Larrabee Tri-Collection Station[4] for interconnection of offshore wind projects in the NY Bight. The

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[4] In March 2023, the State of New Jersey issued an offshore wind solicitation with a requirement for projects to interconnect at the Larrabee site, available here: https://www.nj.gov/bpu/pdf/boardorders/2023/20230306/8D%20ORDER%20OSW%20Third%20Solicitation.pdf.

building of this new substation at the utility's existing Larrabee substation in central New Jersey will provide a single interconnection point for board-approved offshore wind projects.

The offshore wind projects listed in Table D2-1 in Attachment D2 that have a COP under review are presumed to include at least one identified cable route. Proposed cable routes have not yet been announced for the remainder of the projects.

D.2.4 Tidal Energy Projects

The Roosevelt Island Tidal Energy Project is in the East Channel of the East River, a tidal strait connecting Long Island Sound with the Atlantic Ocean in New York Harbor. In 2005, Verdant Power petitioned the Federal Energy Regulatory Commission (FERC) for permission for the first U.S. commercial license for tidal power. In 2012, FERC issued a 10-year license to install up to 1 megawatt (MW) of power (30 turbines/10 TriFrames) at the Roosevelt Island Tidal Energy Project (FERC 2012). In October 2020, Verdant Power installed three tidal power turbines with its new TriFrame mount at its Roosevelt Island Tidal Energy site in New York's East River (U.S. DOE 2021; Verdant Power 2021). See the South Fork Wind Farm (OCS-A 0517) and South Fork Export Cable Project Final EIS (BOEM 2021b) for descriptions of other tidal projects that are more distant from the NY Bight projects in Maine and Massachusetts.

D.2.5 Dredging and Port Improvement Projects

The representative ports identified for potential use by the NY Bight projects in New York and New Jersey are: Port of Albany, Port of Coeymans, Brooklyn Navy Yard, South Brooklyn Marine Terminal, Howland Hook/Port Ivory, Arthur Kill Terminal, Paulsboro Marine Terminal, and New Jersey Wind Port. Some dredging projects have also been proposed or studied at ports that may be used by the NY Bight projects in New York and New Jersey, and are either in operation or are considered reasonably foreseeable:

- Port Ivory is undeveloped, and all new infrastructure is necessary in order to prepare the site for use as a staging and installation facility. The following improvements are discussed in NYSERDA's 2018 Ports Assessment: Port Ivory Pre-front End Engineering Design Report (NYSERDA 2019d):
    - Demolish and dispose of existing asphalt and concrete pavement and structures on site.
    - Clear and grub the site of unmaintained vegetation (e.g., trees, bushes).
    - Install marine structures along the waterfront edges of the site, to provide at least two heavy load wharves to load and unload components.
    - Improve the ground-bearing capacity and grade areas within the site.
    - Install surface treatment (i.e., crushed stone) within laydown areas of the site.
    - Dredge the berthing area to provide sufficient depth for design vessels to safely access the site.

- The Port of Albany is to be used as a manufacturing or fabrication facility. The following improvements are discussed in NYSDERA's 2018 Ports Assessment: Port of Albany-Rensselaer Pre-front End Engineering Design Report (NYSERDA 2019a):
    - Clear and grub the site of unmaintained vegetation (e.g., trees, bushes, etc.).
    - Install marine structures along the waterfront edge of the site, to provide at least two heavy load wharves to load and unload components.
    - Improve the ground-bearing capacity and grade areas within the site.
    - Stabilize the shoreline in order to allow live loads to be applied closer to the crest of the existing shoreline slopes.
    - Install surface treatment (i.e., crushed stone) within laydown areas of the site.
    - Dredge the berthing area to provide sufficient depth for design vessels to safely access the site.
- The Port of Coeymans is currently primarily developed and is anticipating offshore wind projects. The following improvements are discussed in NYSDERA's 2018 Ports Assessment: Port of Coeymans Pre-front End Engineering Design Report (NYSERDA 2019b):
    - Clear and grub unmaintained areas.
    - Install one heavy load quay along the northeastern shoreline.
    - Grade existing site's waterfront area and upland area, as well as the portion of land in between these zones.
    - Install a retaining wall between the westerly and northerly extents that will tie into the site's existing slopes to remain.
    - Improve the ground-bearing capacity across the waterfront portion of the site by placing crushed rock above existing grade.
    - Dredge berth area to allow safe vessel access to the site.
- The South Brooklyn Marine Terminal is an operational marine terminal. The following improvements are discussed in NYSDERA's 2018 Ports Assessment: South Brooklyn Marine Terminal Pre-front End Engineering Design Report (NYSERDA 2019c):
    - Demolish existing buildings and the rail spur on the 39th Street Pier to increase available laydown area and facilitate ground-bearing capacity improvements.
    - Install two heavy load quays, including along the northwest end of the 39th Street Pier and along the southwest end of the 39th Street Pier.

    - Stabilize the 35th Street Pier Revetment to increase the load capacity.
    - Grade existing site.
    - Improve the ground-bearing capacity across the site by placing crushed stone fill above the existing grade.
    - Dredge berth areas to allow safe vessel access to the site.

- The Brooklyn Navy Yard is anticipating major improvements and developments with approximately 5.1 million square feet (.47 million square meters) of vertical manufacturing space, and development of a series of open space and connectivity improvements aimed at integrating the Yard with the surrounding neighborhoods (Brooklyn Navy Yard 2023).

- Arthur Kill Terminal has received $48 million in federal grants to construct Arthur Kill Terminal as an offshore wind staging and assembly coastal seaport on State Island (Empire State Development 2022).

- The Paulsboro Marine Terminal is currently receiving improvements, which will aim to support the offshore wind industry as it is being developed as a facility to manufacture and ship monopile foundations for construction of wind turbines off the coast of New Jersey (Jacobs 2022). Some of the improvements are construction of mooring dolphins, dredging, and upland placement of dredged material, and two fabrication buildings in which steel plate welding, roll bending, and circumferential welding will take place (Jacobs 2022).

- The State of New Jersey is planning to build an offshore wind port on the eastern shore of the Delaware River in Lower Alloways Creek, Salem County, approximately 7.5 miles (12 kilometers) southwest of the city of Salem. The New Jersey Economic Development Authority is leading the development of the project on behalf of the state, working alongside key departments and agencies such as the Governor’s Office, the Department of the Treasury, and the BPU. The development plan includes dredging the Delaware River Channel, and construction commenced in September 2021 with a targeted completion date of late 2023 (New Jersey Wind Port 2021; Salem County 2021). The Delaware River Channel dredging project provides deepening of the existing Delaware River Federal Navigation Channel, bend widening, partial deepening of the Marcus Hook anchorage, and relocation and addition of aids to navigation. The deeper channel will allow for more efficient transportation of containerized, dry and liquid bulk, break bulk, roll-on/roll-off, and project cargoes to and from Delaware River ports (USACE 2022b).

- In 2018, two New Jersey Department of Transportation projects, High Bar Harbor channel and Barnegat Light Stake channel, both near Barnegat Inlet in Ocean and Long Beach Townships, New Jersey, underwent dredging of approximately 39,150 cubic yards and 3,230 cubic yards (29,932 cubic meters and 2,470 cubic meters), respectively, to maintain the depths of these channels. Maintenance dredging for both projects is authorized until December 2025 and is expected to occur before the permits expire (USACE 2015a, 2015b). Barnegat Light is the primary commercial seaport on Long Beach Island and is the homeport to approximately 36 commercial vessels. Barnegat Light's two commercial docks are home to several scallop vessels, longliners, and a fleet of smaller inshore gillnetters.

- The U.S. Army Corps of Engineers (USACE) has received numerous permit applications for private dock, boat lift, and bulkhead repairs in Barnegat Bay, New Jersey (USACE 2022a).

D.2.6 Marine Minerals Use and Ocean Dredged Material Disposal

There are no active OCS lease areas for marine minerals within the other uses geographic analysis area (refer to Section 3.6.7, *Other Uses (Marine Minerals, Military Use, Aviation, Scientific Research and Surveys)*) (BOEM 2018). New York has multiple potential sand resource areas, in state and federal waters, along the coast of Long Island for beach renourishment projects. Within federal waters, there are an additional four potential federal sand resource areas. In New York, there are four identified dredge areas (Marine Cadastre 2023).

In New Jersey, the closest previous lease in BOEM's Marine Minerals Program for sand borrow areas for beach replenishment is known as the D2 borrow area, offshore near Harvey Cedars, Surf City, Long Beach Township, Ship Bottom, and Beach Haven (Lease Number OCS-A-050; executed July 1, 2014). The lessee (USACE and the New Jersey Department of Environmental Protection [NJDEP]) was approved through September 20, 2018, for the use of up to 10,000,000 cubic yards (7,645,550 cubic meters) of material to be used for the Long Beach Island Coastal Storm Risk Management Project, Barnegat Inlet to Little Egg Inlet. At present, there are 15 USACE beach renourishment projects in the USACE North Atlantic Division, which includes the New York and Philadelphia Districts, that may target OCS sand resources (NJDEP pers. comm. 2023). The New York District projects include Sandy Hook to Barnegat Inlet in addition to the Raritan Bay Flood Control Projects of Keansburg, Port Monmouth, Union Beach and Highlands. The Philadelphia District projects include Manasquan Inlet to Barnegat Inlet, Barnegat Inlet to Little Egg Inlet, Brigantine Inlet to Great Egg Inlet (Brigantine), Brigantine Inlet to Great Egg Inlet (Absecon Island), Great Egg Inlet to Pecks Beach, Great Egg Inlet to Townsends Inlet, Townsends Inlet to Cape May Inlet, Hereford inlet to Cape May inlet, Cape May Inlet to Lower Township, and Lower Township to Cape May Point. In addition to the OCS sand resource needs for these projects, USACE has additional beach renourishment projects currently targeting sand resources in state waters/inlets. U.S. Environmental Protection Agency (USEPA) Region 2 is responsible for designating and managing ocean disposal sites for materials offshore in the region of the NY Bight projects. 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 U.S. Code [USC] 1431 et seq. and 33 USC 1401 et seq.).

D.2.7 National Security and Military Use

The Offshore Narragansett Bay Range Complex primarily consists of surface sea space and subsurface space off the coasts of Massachusetts, Rhode Island, and New York. As part of the range complex, the Narragansett Bay Operating Area extends from the shoreline seaward to approximately 180 nm (333 kilometers) from land at its farthest point (Empire 2022). The complex is controlled by the Fleet

Area Control and Surveillance Facility at Virginia Capes Naval Air Station Oceana. The Navy installations primarily operating in this complex are in New London, Connecticut, and Newport, Rhode Island.

The Narragansett Bay Warning Area is in the western portion of the Offshore Narragansett Bay Range Complex and is designated for operations where limitations may be imposed on aircraft not participating in operations. The Narragansett Bay Warning Area is actively used for U.S. Navy subsurface and surface training and testing activities and to prepare submarines and their crews for formal voyages. Additionally, this Warning Area is used to support special-use airspace, flight testing, surface-to-air gunnery exercises using conventional ordnance, antisubmarine warfare exercises, and air-intercept training (Empire 2022).

The Atlantic City Complex is located in waters adjacent to the coasts of New Jersey and New York. The range complex is used for training and testing exercises for the U.S. Atlantic Fleet and supports training and testing by other services, primarily the U.S. Air Force. The AEGIS Combat Systems Center, controlled by the Fleet Area Control and Surveillance Facility Virginia Capes, Naval Air Station, Oceana, also conducts operations in the Atlantic City Complex. The United States Coast Guard (USCG) Air Station Atlantic City, located at the Atlantic City International Airport in Egg Harbor, New Jersey, supports a range of USCG operations, including search and rescue, port security, and marine environmental protection services.

Four danger zones/restricted areas—defined as a “water area (or areas) used for target practice, bombing, rocket firing or other especially hazardous operations, normally for the armed forces”—are in the vicinity of the NY Bight lease areas. The danger zones/restricted areas in the area are at the mouth of the New York Harbor, at the Naval Weapons Station EARLE in Sandy Hook Bay, in the New York Harbor adjacent to the Stapleton Naval Station, and at the Coast Guard Rifle Range off the coast of Cape May (NOD 2022).

There are two Weapons Training Areas operated by the USCG offshore New York and New Jersey within the geographic analysis area. These training areas are used for proficiency training in law enforcement operations (BOEM 2016) and for small caliber weapons training, generally from small vessels that transit during the day to the training area.

D.2.8 Marine Transportation

Marine transportation in the region is diverse and sourced from many ports and private harbors. Commercial vessel traffic in the region includes research, tug/barge, tankers (such as those used for liquid petroleum), cargo, cruise ships, smaller passenger vessels, and commercial fishing vessels. Recreational vessel traffic includes private motorboats and sailboats. 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. Most vessel traffic, excluding recreational vessels, tends to travel within established vessel traffic routes, and the number of trips, as well as the number of unique vessels, has remained consistent (USCG 2021). In response to offshore wind projects in the NY Bight, multiple additional fairways and a new anchorage may be established to route existing vessel traffic around wind energy projects (USCG

2021). 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, and Brooklyn, New York.

D.2.9 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 protected under the Endangered Species Act (ESA). 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. 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 ongoing and planned activities in biological opinions. Stock assessments completed regularly under the 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.

D.2.9.1 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. 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 (NARWs); 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).

D.2.9.2 Fisheries Use and Management

NMFS implements regulations to manage commercial and recreational fisheries in federal waters, including those within the NY Bight lease areas; the State of New Jersey and the State of New York regulate commercial fisheries in their state waters (within 3 nm [5.6 kilometers] of the coastline). The NY Bight overlaps two of NMFS's eight regional councils to manage federal fisheries: the Mid-Atlantic Fishery Management Council (MAFMC), which includes New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina; and the New England Fishery Management Council (NEFMC), which includes Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut (NEFMC 2016). The councils manage species with many Fishery Management Plans (FMPs) 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 states and NMFS, under the framework of ASMFC's *Amendment 3 to the Interstate Fishery Management Plan for American Lobster*, cooperatively manage the American lobster resource and fishery (NOAA 1997).

The FMPs of the councils and ASMFC were established, in part, to manage fisheries to avoid overfishing. They accomplish this through an array of management measures, including annual catch quotas, minimum size limits, and closed areas. These various measures can further reduce (or increase) the size of landings of commercial fisheries in the Northeast and Mid-Atlantic regions.

NMFS also manages highly migratory species, such as tuna and sharks, that can travel long distances and cross domestic boundaries. Table D-3 summarizes other FMPs and actions in the region.

Table D-3. Other fishery management plans

Area	Plan and Projects
ASMFC	ASMFC *Five-Year Strategic Plan 2019–2023* (ASMFC 2019) ASMFC 2022 Action Plan (ASMFC 2021) *Management, Policy and Science Strategies for Adapting Fisheries Management to Changes in Species Abundance and Distribution Resulting from Climate Change* (ASMFC 2018)

Area	Plan and Projects
New York	*New York Ocean Action Plan 2017–2027*: adaptive management plan (NYSDEC 2017) New York State filed a petition with NOAA, NMFS, and MAFMC to demand that commercial fluke allocations be revised to provide fishers with equitable access to summer flounder. NMFS announced specifications for the summer flounder, scup, and black sea fisheries. This action is intended to inform the public of the specifications for the 2023 fishing year for summer flounder, scup, and black sea bass. This rule shows the state-by-state allowable commercial fishing quotas (88 *Federal Register* 11 January 3, 2023).
Long Island Regional Development Council	East Hampton Shellfish Hatchery project will consolidate the hatchery's municipal hatchery and nursing facilities. Haskell's seafood facility in East Quogue is proposed to become a fully functioning seafood processing plant.
New Jersey	NJDEP Division of Fish and Wildlife Marine Fisheries Management Rule Amendment Proposal with amendments to rules governing crab and lobster management, commercial Atlantic menhaden fishery, marine fisheries, and fishery management in New Jersey was published in the March 1, 2021, *New Jersey Register* (New Jersey Division of Fish and Wildlife 2021).

D.2.10 Global Climate Change

Climate change results primarily from the increasing concentration of greenhouse gases (GHGs) in the atmosphere, which causes planet-wide physical, chemical, and biological changes, substantially altering the world's oceans and lands. Changes include increases in global atmospheric and oceanic temperature, shifting weather patterns, rising sea levels, and changes in atmospheric and oceanic chemistry (Blunden and Arndt 2020). Section 7.6.1.4 of the Programmatic EIS *for Alternative Energy Development and Production and Alternate Use of Activities on the Outer Continental Shelf* (Minerals Management Service 2007) describes global climate change with respect to assessing renewable energy development. Key drivers of climate change are increasing atmospheric concentrations of carbon dioxide (CO_2) and other GHGs, such as methane (CH_4) and nitrous oxide (N_2O). These GHGs reduce the ability of solar radiation to re-radiate out of Earth's atmosphere and into space. Although all three of these GHGs have natural sources, the majority of these GHGs are released from anthropogenic activity. Since the industrial revolution, the rate at which solar radiation is re-radiated back into space has slowed, resulting in a net increase of energy in the Earth's system (Solomon et al. 2007). This energy increase presents as heat, raising the planet's temperature and causing climate change.

Fluorinated gases are a type of GHG released in trace amounts but are highly efficient at preventing solar radiation from being re-radiated back into space. They have a much longer lifespan than CO_2, CH_4, and N_2O. Fluorinated gases have no natural sources, are either a product or byproduct of manufacturing, and can have 23,000 times the warming potential of an equal amount of CO_2. These gases include hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride, and sulfur hexafluoride. These gases are currently being phased out; however, sulfur hexafluoride is still used in WTG switchgears and OSS high-voltage and medium-voltage gas-insulated switchgears.

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°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 on terrestrial ecosystems; impacts on marine biodiversity, fisheries, and ecosystems and their functions and services to humans; and impacts on health, livelihoods, food security, water supply, and economic growth (IPCC 2018). High global temperatures increase the amount of sea level rise by the end of the century, with a projected relative sea level rise of 2.0 to 7.2 feet (0.6 to 2.2 meters) along the contiguous United States coastline by 2100 (NOAA 2022). Expected relative sea level rise would cause tide and storm surge heights to increase, leading to a shift in the U.S. coastal flood regimes by 2050 with major and moderate high tide flood events occurring as frequently as moderate and minor high tide flood events occur today (NOAA 2022).

Global emissions of GHGs have impacts whose local effects are increasingly elucidated through research. For example, a recent study concerning the NARW provides evidence that the whale's feeding area moved north following relocation of its food source related to climate change, and whale mortality may have increased because of fewer controls on fishing activities in the new, more northerly area (Meyer-Gutbrod et al. 2021). Climate change is predicted to affect Northeast fishery species in different ways (Hare et al. 2016), and the NMFS biological opinion for *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf in Massachusetts, Rhode Island, New York and New Jersey Wind Energy Areas* also discusses in detail the potential impacts of global climate change on protected species that occur within the NY Bight area (NMFS 2013).

Local emissions, such as those from maintenance of and accidental chemical leaks from wind energy projects, would contribute incrementally to global GHG emissions. However, the largest climate impact from wind energy projects is expected to be beneficial: the energy generated by wind energy projects is expected to displace energy generated by combustion of fossil fuels, which would lead to reductions in regional emissions of air pollutants and GHGs from fossil-fueled power plants.

Table D-4 summarizes regional plans and policies that are in place to address climate change, and Table D-5 summarizes resiliency plans.

Table D-4. Climate change plans and policies

Plans and Policies	Summary/Goal
New York	
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 (NYSERDA 2015, 2017a)	Requires 40% reduction in GHG from 1990 levels, 50% electricity to come from renewable energy resources, and a 600-trillion-British-thermal-unit increase in statewide energy efficiency.
Governor Cuomo State of the State Address 2017, 2018, 2021	2017: Set offshore wind energy development goal of 2,400 MW by 2030 (Governor's Office 2017). 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

Plans and Policies	Summary/Goal
	up to 3,000 MW by 2030 (Office of the Attorney General 2018; Windpower Engineering & Development 2018). 2021: The governor's 2021 agenda—Reimagine | Rebuild | Renew—establishes a goal of building out the renewable energy program. The agenda notes the development of two new offshore wind farms more than 20 miles offshore of Long Island, as well as the creation of dedicated offshore port facilities and additional transmission capacity development.
Governor Kathy 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 gigawatts (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 2017)	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. Initial bids were received in early 2019.
2020 Offshore Wind Solicitation	As noted above, NYSERDA has provisionally awarded two offshore wind projects, totaling 2,490 MW. Empire Wind 2 (OCS-A 0512) (1,260 MW) and Beacon Wind (OCS-A 0520) (1,230 MW) of Equinor Wind US, LLC will generate enough clean energy to power 1.3 million homes and will 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.
The Climate Leadership and Community Protection Act (CLCPA), enacted on July 18, 2019, signed into law in July 2019, and effective January 1, 2020	The act establishes economy-wide targets to reduce GHG emissions by 40% of 1990 levels by 2030 and 85% of 1990 levels by 2050. Establishes a goal of 9.0 GW of offshore wind generation by 2035. The CLCPA requires that 70 percent of New York State's electricity come from renewable sources by 2030 and 100 percent of electricity come from zero-emission sources by 2040. In addition, the CLCPA requires that New York reduce statewide greenhouse gas emissions to at least 40 percent below 1990 levels by 2030 and at least 85 percent below 1990 levels by 2050.
New Jersey	
Executive Order 28: Measures to Advance New Jersey's Clean Energy Economy (2018)	Sets target of total conversion of the state's energy production profile to 100% clean energy sources on or before January 1, 2050.
New Jersey Energy Master Plan (State of New Jersey 2019, 2020)	Updated in 2019, the plan outlines key strategies to reach the State of New Jersey's goal of 100 percent clean energy by 2050, including accelerating development of offshore wind.
Executive Order 100: Protecting Against Climate Threats (PACT); Land Use Regulations and Permitting (2020)	Establishes a GHG monitoring and reporting program, establishes criteria to govern and reduce emissions, and integrates climate change considerations, such as sea level rise, into regulatory and permitting programs.

Plans and Policies	Summary/Goal
Executive Order 307: Increase Offshore Wind Goal to 11,000 Megawatts by 2040 (2022)	Establishes a goal of 11,000 MW of offshore wind energy generation by 2040.

Table D-5. Resiliency plans and policies

Plans and Policies	Summary
New York	
Community Risk and Resiliency Act of 2014	Enacted in 2014, the Act includes five major provisions: 1) Official Sea-level Rise Projections, 2) Consideration of future physical climate risk, 3) Smart Growth Public Infrastructure Policy Act Criteria, 4) Guidance on Natural Resilience Measures, and 5) Model Local Laws Concerning Climate Risk. As of 2019, New York State Department of Environmental Conservation (NYSDEC) is in the process of developing a State Flood Risk Management Guidance document for state agencies (NYSDEC n.d.).
NY Rising Community Reconstruction Program (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 2018).
NYS Smart Growth Program	Community planning and development program with an overall approach of development and conservation strategies that help protect the health and natural environment by making communities more attractive, economically stronger, socially diverse, and resilient to climate change. The Smart Growth policies help communities contribute to both mitigating and adapting to climate change. New York State Department of State administers a portion of the State Smart Growth grant program. More information here: https://dos.ny.gov/nys-smart-growth-program.
New York Water Resources Management	New York encourages community planning at the watershed level. Watershed planning allows communities to integrate water and land resource protection and restoration with growth management at the local and regional level, balancing environmental and economic factors to encourage a healthier, more resilient watershed. New York State provides community assistance in the development and implementation of watershed management plans. More information here: https://dos.ny.gov/water-resources-management.
Local Waterfront Revitalization Program	The Local Waterfront Revitalization Program is New York State's primary program for working in partnership with waterfront communities across New York State. Local Waterfront Revitalization Programs begin with a planning process and are approved at three levels of government (local, state, and federal). Once approved, municipalities are eligible for implementation funds. More information here: https://dos.ny.gov/local-waterfront-revitalization-program.
New York City Watershed Program	The New York City Watershed Program provides technical support for local governments and regional groups in the New York City Watershed. The program provides a regional forum to aid in the long term protection of New York City's drinking water, and the economic vitality of the Upstate Watershed communities. More information here: https://dos.ny.gov/new-york-city-watershed-program.

Plans and Policies	Summary
OneNYC 2050	OneNYC 2050 is a strategy to address challenges facing New York City's future, including addressing climate change. Examples from the strategy include committing to carbon neutrality by 2050 and undertaking comprehensive projects to mitigate climate risk.
NYC Comprehensive Waterfront Plan	Every 10 years, New York City restarts a formal process of thinking collectively about New York City's waterfront and creating a vision for the next decade and beyond. The 2021 Plan, New York City's third Comprehensive Waterfront Plan, puts forth new strategies for an equitable, resilient and healthy waterfront in the face of climate change.
New Jersey	
New Jersey Draft Climate Change Resilience Strategy (NJDEP 2021)	This is New Jersey's first statewide climate resiliency strategy and was released as a draft in April 2021. The *Draft Climate Change Resilience Strategy* develops a framework for policy, regulatory, and operational changes to support the resilience of New Jersey's communities, economy, and infrastructure. It includes 125 recommended actions across the following six priority areas: build resilient and healthy communities, strengthen the resilience of New Jersey's ecosystems, promote coordinated governance, invest in information, increase public understanding, promote climate-informed investments and innovative financing, and develop a coastal resilience plan.

D.2.11 Oil and Gas Activities

The NY Bight lease areas are 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 United States 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 oil and gas exploration, development, or production during the 10-year period beginning July 1, 2022, and ending June 30, 2032. Existing leases in the withdrawn areas are not affected. On September 29, 2023, the U.S. Department of the Interior announced the availability of the 2024–2029 National Outer Continental Shelf Oil and Gas Leasing Proposed Final Program and corresponding Final Programmatic Environmental Impact Statement. The 2024–2029 Proposed Final Program includes three potential OCS oil and gas lease sales in the Gulf of Mexico. It does not include sales in any other BOEM OCS planning area.

BOEM issues geophysical and geotechnical (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 archaeological 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 New York and New Jersey (BOEM 2021c).

Several liquefied natural gas ports are on the East Coast of the United States. Table D-6 lists existing, approved, and proposed liquified natural gas ports on the East Coast that provide (or may provide in the future) services such as natural gas export, natural gas supply to the interstate pipeline system or local distribution companies, storage of liquified natural gas for periods of peak demand, or production of liquified natural gas for fuel and industrial use (FERC 2022a, 2022b).

Table D-6. Liquefied natural gas terminals in the Eastern United States

Terminal Name	Type	Company	Jurisdiction	Distance from NY Bight Lease areas (approximate)	Status
Everett, MA	Import terminal	GDF SUEZ—DOMAC	FERC	90 miles north	Existing
Offshore Boston, MA	Import terminal	Neptune LNG	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 (Buoy B)	Existing
Cove Point, MD (Chesapeake Bay)	Import terminal / Export 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)	Import terminal / Export terminal	Southern LNG Company	FERC	835 miles southwest	Existing
Jacksonville, FL	Export terminal	Eagle LNG Partners	FERC	960 miles southwest	Proposed

Source: FERC 2022a; 2022b.
DOMAC = Distrigas of Massachusetts LLC; GDF = Gaz de France; FL = Florida; GA = Georgia; LNG = liquified natural gas; MA = Massachusetts; MARAD = U.S. Department of Transportation Maritime Administration; MD = Maryland

D.2.12 Onshore Development Activities

Onshore development activities that may contribute to cumulative impacts include visible infrastructure such as onshore wind turbines, buildings (such as offices, retail, and multi-use spaces) and cell towers, port development, transportation projects, onshore coastal developments near landfall locations, and other energy projects such as transmission and pipeline projects. Coastal development projects permitted through regional planning commissions, counties, and towns may also contribute to cumulative impacts. These may include residential, commercial, and industrial developments spurred by population growth in the region (Table D-7).

Table D-7. Existing, approved, and planned onshore development activities

Type	Description
Local planning documents	Atlantic County Planning Board Master Plan (Atlantic County 2018) Camden County Comprehensive Plan (Camden County 2014) Cape May County Comprehensive Plan (Cape May County 2022) City of Atlantic City Master Plan (City of Atlantic City 2016) City of New York 2021–2025 Consolidated Plan (NYC Planning 2021)

Type	Description
	City of Ocean City Master Plan Reexamination Report (City of Ocean City 2019) City of Rensselaer Comprehensive Plan (City of Rensselaer 2006) City of Sea Isle City 2017 Master Plan Reexamination Report (City of Sea Isle City 2017) Creating Resilience: A Planning Initiative, City of Long Beach Comprehensive Plan (City of Long Beach 2018) Gloucester County Community Vision for Gloucester County (Gloucester County 2015) Hudson County Master Plan Re-Examination Report (Hudson County 2016) King County Comprehensive Plan (King County 2016) Monmouth County Planning Board Master Plan (Monmouth County 2016) Nassau County Master Plan (Nassau County Planning Department 2010) Ocean County Master Plan Amendments (Ocean County 2016, Ocean County 2018) Ocean County Planning Board Comprehensive Master Plan (Ocean County 2011) Staten Island Comprehensive Economic Development Strategy 2020 (Staten Island Economic Development Corporation 2020) Salem County Growth Management Element of the Comprehensive County Master Plan (Salem County 2015) Suffolk County Comprehensive Master Plan 2035 (Suffolk County 2015) The City of Albany Comprehensive Plan 2030 (City of Albany 2012) Town of Brunswick Draft Comprehensive Plan (Town of Brunswick 2013) Township of Burlington Comprehensive Plan (Township of Burlington 2008) Township of Egg Harbor Community Development Plan for Business Districts / Economic Development Element (Egg Harbor Township 2017) Township of Union Master Plan (Township of Union 2021)
Onshore wind projects	According to the U.S. Geological Survey, there are three onshore wind projects within 40 miles of the NY Bight lease areas. The Bayonne Wind Energy Project consists of one 1.5 MW turbine with a tip height 103.60 meters and rotor diameter of 77 meters; Jersey Atlantic Wind Farm consists of five 1.5 MW turbines with a tip height of 118.6 meters and rotor diameter of 77.0 meters (Hoen et al. 2021). Additionally, there is one unnamed onshore wind project in Sunset Park, Brooklyn that consists of one turbine. The specifications of that turbine are unknown.
Development projects	As part of New York State's $100 billion infrastructure project, $5.6 billion will go to transform the Long Island Railroad to improve system connectivity. Within Suffolk County, the following stations will receive funds for upgrades: Brentwood, Deer Park, East Hampton, Northport, Ronkonkoma, Stony Brook, Port Jefferson, and Wyandanch. The East Hampton historic Long Island Railroad Station will undergo upgrades and modernizations (Metropolitan Transit Authority 2017; Press Release Point 2017). Additional plans for transit-oriented design and highway improvements are planned in Suffolk County in state and county planning documents. The Fire Island Inlet to Montauk Point Project is a $1.2 billion project by USACE, NYSDEC, and Long Island, New York, municipalities to engage in inlet management; beach, dune, 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 will be involved in this project (USACE 2018). A $2.7 million development project has been proposed for the former site of Bader Field, Atlantic City, adjacent to the Atlantic City estuary. The 143-acre Bader Field, now vacant, was the site of the first airport in the United States. The proposed development would include a 2.44-mile (4-kilometer) auto course, about 2,000 units of housing in various price

Type	Description
	ranges, a retail promenade, and other auto-themed attractions (Associated Press 2022). As part of a comprehensive flood-control strategy, Ocean City, New Jersey, is spending $25 million through 2025 to build new pumping stations, drainage systems, berms and retention walls, and new elevated road construction to control flooding in low-lying areas (City of Ocean City 2021a, 2021b). Additionally, there are several planned federal and state hurricane and storm damage reduction, beach nourishment, coastal storm risk management, flood and coastal storm damage reduction, and ecosystem restoration projects planned along coastal New Jersey (NJDEP 2022).
Port studies/ upgrades	The State of New Jersey is planning to build an offshore wind port on the eastern shore of the Delaware River in Lower Alloways Creek, Salem County, approximately 7.5 miles southwest of the city of Salem. The port site is adjacent to Public Service Electric & Gas's (PSE&G's) Hope Creek Nuclear Generating Station. The New Jersey Economic Development Authority (NJEDA) is leading the development of the project on behalf of the state, working alongside key departments and agencies such as the Governor's Office, the Department of the Treasury, and BPU. Construction commenced in 2021 with a targeted completion date of late 2023. The development plan includes construction of a heavy-lift wharf with a dedicated delivery berth and an installation berth that can accommodate jack-up vessels, a 30-acre marshalling area for component assembly and staging, a dedicated overland heavy-haul transportation corridor, and potential for additional laydown areas. NJEDA estimates the project will cost $300 to $400 million (New Jersey Wind Port 2021). Both the Atlantic Shores South (OCS-A 0499) and Ocean Wind 2 (OCS-A 0532) projects have committed to building a nacelle assembly facility at the New Jersey Wind Port. The nacelle houses the components that convert the mechanical energy of the rotating blades into electrical energy and is the highest value-added offshore wind component. Atlantic Shores plans to partner with MHI Vestas for this facility while Ocean Wind will collaborate with General Electric (BPU 2021). In 2020, the State of New Jersey announced a $250 million investment in a manufacturing facility to build steel components for offshore wind turbines at the Port of Paulsboro on the Delaware River in New Jersey (New Jersey State 2020). Construction on the facility began in January 2021, with production anticipated to begin in 2023 (New Jersey Business 2020). Both the Atlantic Shores South and Ocean Wind 2 projects will utilize the foundation manufacturing facility at the Port of Paulsboro (BPU 2021). Ports in New York 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 2017). Nearly all identified sites would require some level of infrastructure upgrade (from minimal to significant) depending on offshore wind activities intended for the site. Particular sites of interest include Red Hook-Brooklyn, South Brooklyn Marine Terminal, and the Port of Coeymans (NYSERDA 2017). For additional information regarding specific proposed improvements to these ports, see Capital Region Economic Development Council 2018, American Association of Port Authorities 2016, Rulison 2018, and NYCEDC 2018. New York State has proposed port improvements that include the governor's 2021 agenda "Reimagine | Rebuild | Renew," which includes upgrades to create five dedicated port facilities for offshore wind, including the following:

Type	Description
	• 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

Attachment D1: Ongoing and Planned 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 planned non-offshore-wind activities.

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Table D1-1. Summary of non-offshore-wind 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 hazardous air pollutants (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. See Table D1-23 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 35 years 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 Clean Air Act (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 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 will likely decrease GHGs emissions by replacing energy from fossil fuels.	The largest air quality impacts over the next 35 years would occur during the construction phase of any one project; however, projects will be required to comply with the CAA. During the limited construction and decommissioning phases, emissions may occur that are above *de minimis* thresholds and will 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.
Air emissions: O&M		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 35 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 planned onshore 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 planned 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, 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.
Accidental releases: Fuel/ fluids/hazmat	Accidental releases of air toxics or hazardous air pollutants (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. See Table D1-23 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 35 years 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.

hazmat = hazardous materials

Table D1-2. Summary of non-offshore-wind activities and the associated impact-producing factors for bats

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 temporary threshold shifts (TTS) than other terrestrial mammals (Simmons et al. 2016). Indirect impacts (i.e., displacement from potentially suitable habitats) could occur because of construction activities, which could generate noise sufficient to cause avoidance behavior (Schaub et al. 2008). Construction activity would be temporary and highly localized.	Similar to 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 temporary 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 temporary. 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: Migration disturbances	There may be a few structures scattered throughout the offshore bats geographic analysis area, such as navigation and weather 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.	The infrequent installation of future new structures in the marine environment of the next 35 years is expected to continue. As 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 35 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.	Planned 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.

Table D1-3. Summary of non-offshore-wind activities and the associated impact-producing factors for benthic resources

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	See Table D1-23 for a discussion of ongoing accidental releases. 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 35 years would increase the risk of accidental releases. See the previous cell and Table D1-23 on 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 temporary 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 temporary, 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.
Cable emplacement and maintenance	Cable maintenance activities infrequently disturb benthic resources and cause temporary 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 temporary 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.
Cable emplacement and maintenance: 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.
Cable emplacement and maintenance: 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 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 of, 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 sediment deposition that occur naturally in the geographic analysis area.	USACE 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.
Discharges/intakes	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 issued by USACE; these discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated.
Electric and magnetic fields and cable heat	Electromagnetic fields (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 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.	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise: Onshore/offshore construction	See Table D1-10 on finfish, invertebrates, and essential fish habitat (EFH). Detectable impacts of construction noise on benthic resources rarely, if ever, overlap from multiple sources.	See Table D1-10 on finfish, invertebrates, and EFH. Detectable impacts of construction noise on benthic resources would rarely, if ever, overlap from multiple sources.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Noise: G&G	See Table D1-10 on finfish, invertebrates, and EFH. Detectable impacts of G&G noise on benthic resources rarely, if ever, overlap from multiple sources.	See Table D1-10 on finfish, invertebrates, and EFH. Detectable impacts of G&G noise on benthic resources would rarely, if ever, overlap from multiple sources.
Noise: O&M	See Table D1-10 on finfish, invertebrates, and EFH.	See Table D1-10 on 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 temporary, and they 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 35 years and localized and temporary 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.
Port utilization: Expansion	See Table D1-10 on finfish, invertebrates, and EFH.	See Table D1-10 on finfish, invertebrates, and EFH.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear are 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 Table D1-10 on finfish, invertebrates, and EFH.	See Table D1-10 on 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 35 years would likely require hard protection atop portions of the route (see the “Cable emplacement and maintenance” IPF). 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.

hazmat = hazardous materials

Table D1-4. Summary of non-offshore-wind activities and the associated impact-producing factors for birds

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	See Table D1-23 for a quantitative analysis of these risks. 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.	See Table D1-23 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 35 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 35 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.
Cable emplacement and maintenance	Cable emplacement and maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be temporary and generally limited to the emplacement corridor. Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances will be temporary 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 temporary increases in suspended sediment, resulting in localized, short-term impacts, with no biologically significant impacts on individuals or populations.
Lighting: 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 temporary. 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 35 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.
Lighting: 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.
Cable emplacement and maintenance	Cable emplacement and maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be temporary and generally limited to the emplacement corridor. Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances will be temporary 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 temporary increases in suspended sediment, resulting in localized, short-term impacts, with no biologically significant impacts on individuals or populations.
Land disturbance: Onshore construction	Onshore construction activity will 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.
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 temporary 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 temporary and impacts 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 could result in diving birds leaving the local area. Non-diving birds would be unaffected. Any displacement would only be temporary 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.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 could result in intermittent, temporary, 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 temporary, and no individual fitness or population-level impacts would be expected.	Onshore construction will 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.
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 35 years, would likely require hard protection atop portions of the cables (see the “Cable emplacement and maintenance” IPF). 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 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 35 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 35 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. 2022). 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.
Land disturbance: Onshore construction	Onshore construction activity will 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.

hazmat = hazardous materials

Table D1-5. Summary of non-offshore-wind activities and the associated impact-producing factors for coastal habitat and fauna

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental release and discharge	See Table D1-23 for a discussion of ongoing accidental releases. 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 coastal resources. The chemicals with potential to sink or dissolve rapidly often dilute to non-toxic levels before they affect coastal resources. The corresponding impacts on coastal resources are rarely noticeable.	Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases. See the previous cell and Table D1-23 on water quality for details.
Anchoring	Regular vessel anchoring related to ongoing military, survey, commercial, and recreational activities continue to cause temporary 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 coastal benthic resources, as well as physical damage to their habitats. All impacts are localized, turbidity is temporary, 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 for coastal habitat and fauna other than ongoing activities.
Cable emplacement and maintenance	Cable maintenance activities infrequently disturb coastal resources and cause temporary 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 coastal benthic resources and result in temporary to long-term habitat alterations. The intensity of impacts depends on the time (season) and place (habitat type) where the activities occur.	No future activities were identified within the geographic analysis area for coastal habitat and fauna other than ongoing activities.
Electric and magnetic fields and cable heat	Electromagnetic fields (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 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 coastal benthic resources is likely undetectable.	No future activities were identified within the geographic analysis area for coastal habitat and fauna other than ongoing activities.
Light	Buoys, towers, and onshore structures with lights can attract coastal fauna. Onshore structures like houses and ports emit a great deal more light than offshore buoys and towers. 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.
Noise: Onshore construction	Onshore construction is routinely used in generic infrastructure projects. Equipment could potentially cause displacement. Any displacement would only be temporary, and no individual fitness or population-level impacts would be expected.	Onshore construction will continue at current trends. Some behavioral responses could range from avoidance behavior to mild annoyance, but no individual injury or mortality would be expected.
Presence of structures	See Table D1-3 on benthic resources.	See Table D1-3 on benthic resources.
Land disturbance: Onshore construction	Onshore residential, commercial, and industrial development are expected to continue at current trends. Construction activities may result in loss of coastal habitat and temporary or permanent displacement and injury to or mortality of individual animals, but population-level effects would not 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 but would not be expected to result in injury or mortality of individuals.
Land disturbance: Onshore land use changes	Ongoing development of onshore properties, especially shoreline parcels, periodically causes the conversion of onshore coastal habitats to become developed space. Onshore construction activity will 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.
Traffic: Vehicle collisions	Vehicle collisions may result in injury to or mortality of individual animals, but population-level effects would not be expected.	Impacts from vehicle collisions with wildlife are expected to continue and to occur at the current rate.

Table D1-6. Summary of non-offshore-wind activities and the associated impact-producing factors for commercial fisheries and for-hire recreational fishing

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 35 years due to offshore military operations, survey activities, commercial vessel traffic, and recreational vessel traffic. Anchoring could pose a temporary (hours to days), localized (within a few hundred meters of anchored vessel) navigational hazard to fishing vessels.
Cable emplacement and maintenance	New cable emplacement and infrequent cable maintenance activities disturb the seafloor, increase suspended sediment, and cause temporary 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 temporary 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 temporary. Infrequent offshore trenching could occur in connection with cable installation. These disturbances are temporary and localized, and they 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 35 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 temporary and localized, and they 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 temporary 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 35 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 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 temporary.
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 temporary, 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 for commercial fisheries and for-hire recreational fishing, 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 temporary 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 35 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 35 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 buoys and shoreline developments such as docks and ports. 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. 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.	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 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 for commercial fisheries and for-hire recreational fishing, other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
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 35 years, would likely require hard protection atop portions of the route (see "Cable emplacement/ and maintenance" IPF). 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 35 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.
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 commercial fisheries and for-hire recreational fishing, 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 commercial fisheries and for-hire recreational fishing, 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.

Table D1-7. Summary of non-offshore-wind activities and the associated impact-producing factors for cultural resources

Associated IPF: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/fluids/ hazmat	See Table D1-23 for water quality for a quantitative analysis of these risks. 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 35 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 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 traditional cultural properties (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.
Cable emplacement and 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.
Gear utilization: Dredging	Activities associated with dredge operations and activities could damage marine archaeological resources. Ongoing activities identified by BOEM with the 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.	Dredging activities would gradually increase through time as new offshore infrastructure is built, such as gas pipelines and electrical lines, and as ports and harbors are expanded or maintained.
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.
Lighting: 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.

Associated IPF: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Lighting: 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.
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.

hazmat = hazardous materials

Table D1-8. Summary of non-offshore-wind activities and the associated impact-producing factors for demographics, employment, and economics

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be localized and limited to emplacement corridors. There are six existing power cables in the geographic analysis area for demographics, employment, and economics.	Future new cables would disturb the seafloor and cause temporary increases in suspended sediment resulting in infrequent, localized, short-term impacts over the next 35 years.
Land disturbance: Onshore construction	Onshore development activities support local population growth, employment, and economies. Disturbances can cause temporary, 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.
Lighting: 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.
Lighting: 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.
Noise: Cable laying/ trenching	Infrequent trenching for pipeline and cable-laying activities emit noise. These disturbances are temporary 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 35 years for repair or new installation of underground infrastructure.
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 temporary 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: 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.
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 Paulsboro Marine Terminal 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 35 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 35 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.
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 35 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.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
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 35 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 are anticipated.

FAD = fish aggregating device

Table D1-9. Summary of non-offshore-wind activities and the associated impact-producing factors for environmental justice

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 developments may include emission-producing industry and new developments that would increase emissions from motor vehicles. Some historically industrial waterfront locations will continue to lose industrial uses, with no new industrial development to replace it.
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 developments may include emission-producing industry and new developments that would increase emissions from motor vehicles. Some historically industrial waterfront locations will continue to lose industrial uses, with no new industrial development to replace it.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be localized and limited to emplacement corridors.	Future new cables would disturb the seafloor and cause temporary increases in suspended sediment, resulting in infrequent, localized, short-term impacts over the next 35 years.
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.
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.
Lighting: 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.
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 temporary and localized, and they 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 temporary and localized, and they 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 35 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.
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 Paulsboro Marine Terminal 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 35 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.

Table D1-10. Summary of non-offshore-wind activities and the associated impact-producing factors for finfish, invertebrates, and essential fish habitat

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	See Table D1-23 for a quantitative analysis of these risks. Ongoing releases are frequent/chronic. Impacts, including mortality, decreased fitness, and contamination of habitat, are localized and temporary, and rarely affect populations.	See Table D1-23 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 35 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 resulting impacts on invertebrates and finfish depend on many factors but can be widespread and permanent, especially if the invasive species becomes established and outcompetes native species. 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 finfish, invertebrates, and essential fish habitat, other than ongoing activities.
Anchoring	Vessel anchoring related to ongoing military use and survey, commercial, and recreational activities continue to cause temporary 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).	Impacts from anchoring may occur on a semi-regular basis over the next 35 years due to 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 temporary, 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.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary 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 temporary 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 temporary 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.
Cable emplacement/ maintenance: 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 finfish, invertebrates, and essential fish habitat, other than ongoing activities.
Cable emplacement and maintenance: 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 finfish, invertebrates, and essential fish habitat, other than ongoing activities.
Discharge/intakes	Water quality impacts from ongoing onshore and offshore activities affect nearshore habitats, and accidental spills can occur from pipeline or marine shipping. Invasive species can be accidentally released in the discharge of ballast water and bilge water from marine vessels.	No future activities were identified within the geographic analysis area for finfish, invertebrates, and essential fish habitat, other than ongoing activities.
Electric and magnetic fields and cable heat	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.
Gear utilization	Abandoned or lost fishing gear remains in the aquatic environment for extended time periods, often entangling or trapping mobile invertebrate and fish species. Based on data from NOAA, bycatch affects many species throughout the geographic analysis area—most notably, windowpane flounder, blueback herring, shark species, and hake species. The majority of bycatch is a result of open area scallop trawls, large-mesh otter trawls, conch pots, and fish traps (NOAA 2019).	Future pre-construction, construction, and post-construction fisheries monitoring surveys for ongoing and planned non-offshore-wind projects would continue to harvest finfish and macroinvertebrates. These surveys could include trawl surveys (affecting finfish and squid) and clam dredge surveys (ocean quahog and surfclam). Trawl and gillnet surveys for fisheries monitoring would likely result in direct on fish, invertebrates, and essential fish habitat and has the potential to result in injury and mortality, reduced fecundity, and delayed or aborted spawning migrations.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Lighting: 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.
Lighting: 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.
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 temporary. 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 temporary 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 35 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 temporary.
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 results of Thomsen et al. (Thomsen et al. 2015), sound pressure levels (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.	New or expanded marine minerals extraction and commercial fisheries may intermittently increase noise during their O&M over the next 35 years. Impacts would likely be small and localized.
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 finfish, invertebrates, and essential fish habitat, 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 temporary 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 35 years, temporary, 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 temporary 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.
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 35 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 will increase modestly. The ability of ports to receive the increase may require port modifications, leading to localized impacts. Future channel-deepening activities will 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

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
		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 finfish, invertebrates, and essential fish habitat, 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. Structure-oriented fishes are attracted to these locations. These impacts are localized and often permanent. Fish aggregation may be considered adverse, beneficial, or neutral.	New cables, installed incrementally in the geographic analysis area for this resource over the next 20 to 35 years, would likely require hard protection atop portions of the route (see 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 35 years, would likely require hard protection atop portions of the route (see 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 [Chapter 7]). 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 35 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 Table D1-5 on coastal habitats.	See other sub-IPFs within the Presence of structures IPF. See Table D1-5 on coastal habitats.

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

Table D1-11. Summary of non-offshore-wind activities and the associated impact-producing factors for land use and coastal infrastructure

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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.
Lighting: 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 Paulsboro Marine Terminal 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.
Traffic	Onshore construction is not anticipated to noticeably add to the traffic of the local roadway system.	Onshore ongoing and planned development would likely disrupt road traffic for a short period of time depending on the type of development.

hazmat = hazardous materials

Table D1-12. Summary of non-offshore-wind activities and the associated impact-producing factors for marine mammals

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See Table D1-23 for a quantitative analysis of these risks. 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 (Table D1-10).	See Table D1-23 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 35 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 (Table D1-10).
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 35 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).
Cable emplacement and maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will 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 temporary, and any impacts would be temporary and short term. Turbidity associated with increased sedimentation may result in temporary, short-term impacts on marine mammal prey species (Table D1-10).	The impact on water quality from accidental sediment suspension during cable emplacement is temporary and 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 temporary, and any negative impacts would be temporary and short term. Turbidity associated with increased sedimentation may result in temporary, short-term impacts on some marine mammal prey species (Table D1-10).
Electric and magnetic fields and cable heat	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 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 temporary 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.	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, 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.
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 will 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 for marine mammals, other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
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 (permanent threshold shifts [PTS]/temporary threshold shifts [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.
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 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 temporary 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, LFC are at a greater risk of experiencing Level B Harassment produced by vessel traffic.	Any offshore projects that require the use of ocean vessels could potentially result in long-term but infrequent impacts on marine mammals, including temporary 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 unlikely given the patchy distribution of marine mammals. No stock or population-level effects would be expected.
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 temporary and 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: 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 for marine mammals, other than ongoing activities.
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.
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 temporary, short-term impacts, if any, on marine mammals. Vessel noise may affect marine mammals, but response would be expected to be temporary and short term (see Vessels: Noise sub-IPF above). The impacts on water quality from sediment suspension during port expansion activities is temporary and short term and would be similar to those described under the 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 will increase modestly. The ability of ports to receive the increase in larger ships will 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).
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	No future activities were identified within the marine mammal geographic analysis area for marine mammals, other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
	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.	
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 will 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: Avoidance/ displacement	No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably 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.	Not contemplated for non-offshore-wind facility sources.
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 (Pace and Silber 2005; Vanderlaan and Taggart 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 marine mammals makes stock or population-level effects unlikely (Navy 2018).

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

Table D1-13. Summary of non-offshore-wind activities and the associated impact-producing factors for navigation and vessel traffic

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 temporary to 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 term and could include congestion in ports, delays, and changes in port usage by some fishing or recreational vessel operators.	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 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 35 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.	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). Even with increased port visits by deep-draft vessels, this is still a relatively small effect when considering the whole of Atlantic Coast vessel traffic. The presence of navigational 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 “Anchoring” IPF.	See “Anchoring” IPF.
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 temporary increases in vessel traffic and navigational complexity.	Future new cables would cause temporary increases in vessel traffic during installation or maintenance, resulting in infrequent, localized, short-term impacts over the next 35 years. Care would need to be taken by vessels that are crossing the cable routes during these activities.
Traffic: Aircraft	USCG Search and Rescue (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 PEIS Section 3.6.6 provides a discussion of navigation impacts on fishing vessel traffic.
Traffic: Vessels	See “Presence of structures: Navigation hazard” sub-IPF.	See “Presence of structures: Navigation hazard” sub-IPF.
Traffic: Vessels, collisions	See “Presence of structures: Navigation hazard” sub-IPF.	See “Presence of structures: Navigation hazard” sub-IPF.

Table D1-14. Summary of non-offshore-wind activities and the associated impact-producing factors for other uses: national security and military use

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 PEIS 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 PEIS Section 3.6.6.
Traffic: Vessels, collisions	Current vessel traffic in the region is described in Draft PEIS 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 PEIS Section 3.6.6.

FAD = fish aggregating device

Table D1-15. Summary of non-offshore-wind activities and the associated impact-producing factors for other uses: aviation and air traffic

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 (61 meters) 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 (61 meters) 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 D1-16. Summary of non-offshore-wind activities and the associated impact-producing factors for other uses: cables and pipelines

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 D1-17. Summary of non-offshore-wind activities and the associated impact-producing factors for other uses: marine minerals

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 D1-18. Summary of non-offshore-wind activities and the associated impact-producing factors for other uses: radar systems

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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. Existing wind developments in the area include the Jersey-Atlantic Wind Farm in Atlantic City, New Jersey.	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 D1-19. Summary of non-offshore-wind activities and the associated impact-producing factors for other uses: scientific research and surveys

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 D1-20. Summary of non-offshore-wind activities and the associated impact-producing factors for recreation and tourism

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 temporary, localized impacts of navigational hazards, increased turbidity levels, and potential for direct contact causing mortality of benthic resources.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary 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.
Lighting: 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.
Lighting: 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.
Cable emplacement/ maintenance	Existing cables may require access for maintenance activities. Infrequent cable maintenance activities may cause temporary increases in vessel traffic and navigational complexity for recreational vessels.	Future new cables would cause temporary increases in vessel traffic during installation or maintenance, resulting in infrequent, localized, short-term impacts over the next 35 years. Care would need to be taken by vessels that are crossing the cable routes during these activities.
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 temporary 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.
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.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 35 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.
Presence of structures: Viewshed	The only existing offshore structures within the viewshed of the projects are minor features such as buoys.	Non-offshore-wind structures that could be viewed in conjunction with the offshore components of the projects 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 35 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 D1-21. Summary of non-offshore-wind activities and the associated impact-producing factors for sea turtles

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/ fluids/hazmat	See Table D1-23 for a quantitative analysis of these risks. 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. 2021) 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. 2021; Vargo et al. 1986). Additionally, accidental releases may result in impacts on sea turtles due to effects on prey species (Table D1-10).	See Table D1-23 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 35 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. 2021; 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. 2021; Vargo et al. 1986). Additionally, accidental releases may result in impacts on sea turtles due to effects on prey species (Table D1-10).
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 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).	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. 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).
Cable emplacement and maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will 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 sedimentation may result in short-term, temporary impacts on sea turtle prey species (Table D1-10).	The impact on water quality from accidental sediment suspension during cable emplacement is short term and temporary. If elevated turbidity caused any behavioral responses such as avoidance of the turbidity zone or changes in foraging behavior, such behaviors would be temporary, and any impacts would be short term and temporary. Turbidity associated with increased sedimentation may result in short-term, temporary impacts on some sea turtle prey species (Table D1-10).
Electric and magnetic fields and cable heat	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	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 (MMS 2007: Section 5.2.7). 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.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
	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 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; 2020). 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).	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.
Lighting: 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 temporary.	Construction, operations, and decommissioning vessels associated with non-offshore-wind activities produce temporary 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.
Lighting: 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.
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: Impact and vibratory 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: SEL_{24h} 210 dB re 1 μPa^2 s or greater than Lpk 207 dB re 1 μPa (Popper et al. 2014) • PTS: SEL_{24h} 204 dB re 1 μPa^2 s, Lpk 232 dB re 1 μPa (Finneran et al. 2017) • TTS: SEL_{24h} 189 dB re 1 μPa^2 s, Lpk 226 dB re 1 μPa (Finneran et al. 2017) • Behavioral harassment: SPL 175 dB re 1 μPa (Finneran et al. 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) suggest 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 temporary 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 temporary 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.
Noise: Drilling	Noise from drilling prior to pile-driving could occur in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Drilling activities used prior to pile-driving activities to remove soil or boulders from inside the piles in cases of pile refusal may produce SPL of 140 dB re μPa at 3,280 ft (Austin et al. 2018). This would exceed the continuous noise threshold of 120 dB re 1 μPa (Table 3.7-3) beyond 3,000 ft, but these events are expected to be short term, which limits the sea turtles potentially present during construction. While behavioral responses may occur from drilling, they are not expected to be long lasting or biologically significant to sea turtle populations.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
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	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 temporary stress

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
	away), altered submergence patterns, and a temporary 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.	response (NSF and USGS 2011; Samuel et al. 2005). These brief responses would be expected to dissipate once the aircraft has left the area.
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, temporary impacts, if any, on sea turtles. Vessel noise may affect sea turtles, but response would be expected to be short term and temporary (see the Vessels: Noise sub-IPF above). The impacts on water quality from sediment suspension during port expansion activities are short term and temporary, and would be similar to those described under the 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 will increase modestly. The ability of ports to receive the increase in larger ships will 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 forage items and shelter for sea turtles 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 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 will continue to provide foraging opportunities for sea turtles with measurable benefits to some individuals.
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).
Gear utilization	A primary threat to sea turtles is their unintended capture in fishing gear, which can result in drowning or cause injuries that lead to mortality (e.g., swallowing hooks). For example, trawl fishing is among the greatest continuing primary threats to the loggerhead turtle (NMFS and USFWS 2019), and sea turtles are also caught as bycatch in other fishing gear, including longlines, gillnets, hook and line, pound nets, pot/traps, and dredge fisheries. A	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
	substantial impact of commercial fishing on sea turtles is the entrapment or entanglement that occurs with a variety of fishing gear.	

µPa = micropascal; µT = microtesla; AC = alternating current; L_{pk} = peak sound pressure level in units of decibels referenced to 1 micropascal; SEL_{24h} = sound exposure level over 24 hours (in units of decibels referenced to 1 micropascal squared second).

Table D1-22. Summary of non-offshore-wind activities and the associated impact-producing factors for scenic and visual resources

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases	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.	Planned 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	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.
Lighting	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.
Presence of structures	Buoys are the only existing stationary structures within the offshore viewshed of the projects. 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	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.

Table D1-23. Summary of non-offshore-wind activities and the associated impact-producing factors for water quality

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned 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 will 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 35 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 35 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, and temporary.
Cable emplacement and 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 temporary 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 35 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 will increase modestly. The ability of ports to receive the increase in larger ships will 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 will increase modestly over the next 35 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 include temporary sediment disturbance during maintenance. This sediment suspension would lead to interim and localized impacts.
Discharges/intakes	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 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 will 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 D1-24. Summary of non-offshore-wind activities and the associated impact-producing factors for wetlands

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/oil	Onshore construction activities are a potential source of wetland water contamination from heavy equipment oil leaks or accidental spills. Precipitation events could potentially mobilize the soils into nearby wetlands, leading to alteration of water quality.	Onshore construction activities would require heavy equipment use and HDD activities, and potential spills could occur because of an inadvertent release from the machinery or during refueling activities. Applicants would develop and implement a Spill Prevention, Control, and Countermeasure Plan to minimize impacts on water quality (prepared in accordance with applicable NJDEP and NYSDEC regulations). Minor and short-term impacts are unlikely to affect wetland water quality.
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. 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 are that port activity and land development will 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 D2: 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 NY Bight PEIS 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 the Draft PEIS's Chapter 3, No Action Alternative 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 planned offshore wind development.

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Table D2-1. Offshore wind development activities on the U.S. East Coast: projects and assumptions (part 1, turbine and cable design parameters) November 2023

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]
			Air Quality and GHG Emissions, Water Quality, Navigation	Benthic Resources	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Coastal Habitats	Demographics, Environmental Justice	Marine Archaeology	Other Marine Uses (excluding research surveys & navigation)	Visual, Recreation & Tourism									
ME	Aqua Ventus (Maine state waters)	State Project			X						2024	2	11					450	520
	Total Other State Waters											**2**	**11**						
EXISTING AND ONGOING PROJECTS																			
MA/RI	Block Island (state waters)	Built			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						2023	62	800	98	6.5	171	451	721	812
MA/RI	South Fork Wind, OCS-A 0517	COP Approved (ROD issued 2021), PPA, SAP			X						2023	12	132	139	6.5	24	358	543	614
VA/NC	CVOW Pilot, OCS-A 0497	RAP, FDR/FIR			X						Built	2	12	27	3.3	9	364	506	620
MA/RI	Revolution Wind, part of OCS-A 0486	COP Approved (ROD issued 2023), PPA, SAP			X						2024	100	880	42	6.5	155	512	722	873
NY/NJ	Ocean Wind 1, OCS-A 0498	COP Approved (ROD issued 2023), PPA, SAP	X	X	X	X	X	X	X	X	2024–2025	98	1,100	194	7	190	512	788	906
	Total Existing and Ongoing Projects											**279**	**2,954**	**528**		**551**			
PLANNED PROJECTS																			
Massachusetts/Rhode Island Region																			
MA/RI	Sunrise Wind, OCS-A 0487	COP, PPA, SAP			X						2024	94	934	209.2	13	180	459	656	787
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						2024	62	804	125	10	139	702	935	1,171
MA/RI	New England Wind, OCS-A 0534, and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	COP, PPA, SAP			X						2025 or later	63	1,725	226	10	201	702	935	1,171
MA/RI	SouthCoast Wind, OCS-A 0521	COP, PPA, SAP			X						2025	147	2,400	1,179	6.5	497	605	919	1,066
MA/RI	Beacon Wind 1, part of OCS-A 0520	COP (unpublished), PPA, SAP			X						2026–2029	77	1,100	202	6.5	187	591	984	1,083
MA/RI	Beacon Wind 2, part of OCS-A 0520	COP (unpublished), SAP			X						2027–2030	78	1,128	202	6.5	187	591	984	1,083
MA/RI	Bay State Wind, part of OCS-A 0500	SAP, COP (unpublished)			X						By 2030, spread over 2026–2030	94	1,128	139	6.5	148	492	722	853
MA/RI	OCS-A 0500 remainder	Planning			X						By 2030, spread over 2026–2030	116	1,392	200	6.5	240	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]
			Air Quality and GHG Emissions, Water Quality, Navigation	Benthic Resources	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Coastal Habitats	Demographics, Environmental Justice	Marine Archaeology	Other Marine Uses (excluding research surveys & navigation)	Visual, Recreation & Tourism									
MA/RI	OCS-A 0487 remainder	Planning			X						By 2030, spread over 2026–2030			200	6.5		492	722	853
MA/RI	Vineyard Wind Northeast, part of OCS-A 0522	Planning			X						By 2030, spread over 2026–2030	157	2,400	532	33	221	787	1,050	1,312
	Total MA/RI Leases[2]											**888**	**13,111**	**3,214**		**2,000**			
New York/New Jersey Region																			
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	X	X	X	X	X	X	X	2025-2027	200	2,837[10]	441	3.3	547	574	919	1,049
NY/NJ	Atlantic Shores North, OCS-A 0549	COP (unpublished), SAP	X	X	X	X	X	X	X	X	By 2030, spread over 2026–2030	157	2,355	331	3.3	528	574	919	1,049
NY/NJ	Ocean Wind 2, part of OCS- A 0532	PPA	X	X	X	X	X	X	X	X	By 2030, spread over 2026-2030	111	1,554	200	7	173	512	788	906
NY/NJ	Empire Wind 1, part of OCS-A 0512	COP, PPA, SAP	X	X	X	X	X	X	X	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	X	X	X	X	X	X	X	2023–2027	90	1,260	30	5	166	525	853	951
NY/NJ	NY Bight lease areas (OCS-A 0537, OCS-A 0538, OCS-A 0539, OCS-A 0541, OCS-A 0542, and OCS-A 0544)	Planning	X	X	X	X	X	X	X	X	Start between 2026 and 2030 (construction may extend beyond 2030)	1,103[11]	NA	1,772[12]	131[13]	1,582[14]	NA	1,214[15]	1,312[16]
	Total NY/NJ Leases											**1,718**	**8,822**	**2,820**		**3,129**			
Maryland/Delaware Region																			
DE/MD	Skipjack, part of OCS-A 0519	COP, PPA, SAP			X						2024	16	192	40	6.5	23.7	492	722	853
DE/MD	US Wind/Maryland Offshore Wind Project, part of OCS-A 0490	PPA, SAP			X						2024	121	2,000	145	6.5	152	528	820	938
DE/MD	GSOE I, OCS-A 0482	Planning	X		X						By 2030, spread over 2023–2030	94	1,128	200	6.5	139.1	492	722	853
DE/MD	OCS-A 0519 remainder	Planning			X								1,128	200	6.5	139.1	492	722	853
	Total DE/MD Leases											**231**	**4,376**	**585**		**454**			
Virginia/North Carolina/South Carolina Region																			
VA/NC	CVOW-C, OCS-A 0483	COP, SAP			X						2025–2027	202	3,000	417	5	300	489	761	869
VA/NC	Kitty Hawk North, OCS-A 0508	COP, SAP			X						2024–2030	69	1,242	112	29.5	149	574	935	1,042

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]
			Air Quality and GHG Emissions, Water Quality, Navigation	Benthic Resources	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Coastal Habitats	Demographics, Environmental Justice	Marine Archaeology	Other Marine Uses (excluding research surveys & navigation)	Visual, Recreation & Tourism									
VA/NC	Kitty Hawk Wind South, OCS-A 0508	COP			X						2026–2027	121	2,178	353	29.5	200	574	935	1,042
SC	TotalEnergies Renewables Wind, OCS-A 0545	Planning			X						By 2030, spread over 2026–2030	64	785	200	6.5	179.1	492	722	853
SC	Duke Energy Renewables Wind, OCS-A 0546	Planning			X						By 2030, spread over 2026–2030	64	788	200	6.5	94.7	492	722	853
	Total VA/NC/SC Leases											**520**	**7,057**	**1,129**		**923**			
	OCS Total (PLANNED)[9]											**3,357**	**33,366**	**7,749**		**6,506**			
	OCS Total[9]											**3,636**	**36,320**	**8,277**		**7,057**			

[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, and MD lease areas, a 1×1–nm grid spacing is assumed. For the CVOW 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, 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 interlink cable would be required to link the two OSSs. Interarray cable is assumed to be buried between 4 and 6 feet (1.2 and 1.8 meters).
[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] Atlantic Shores South consists of two energy facilities (Project 1 and Project 2). Project 1 would have a capacity of 1,510 MW; Project 2's capacity is not yet determined, but Atlantic Shores has a goal of 1,327 MW.
[11] Total turbines across all six NY Bight lease areas provided by the lessees. These are estimates used for analysis purposes only and do not reflect the actual number of turbines that may be constructed in each NY Bight lease area.
[12] Total export cable length is the anticipated total across all six NY Bight lease areas as calculated by BOEM based upon information provided by the lessees.
[13] Cable disturbance width based on max value of the RPDE.
[14] Total interarray cable length is the anticipated total across all six NY Bight lease areas provided by the lessees.
[15] Rotor diameter based on max value of the RPDE.
[16] Height of turbine based on max value of the RPDE.
CT = Connecticut; CVOW = Coastal Virginia Offshore Wind; DE = Delaware; FDR = Facility Design Report; FIR = Fabrication and Installation Report; GSOE = Garden State Offshore Energy; MA = Massachusetts; MD = Maryland; NA = not applicable; NC = North Carolina; NE = New England; NJ = New Jersey; NY = New York; PPA = Power Purchase Agreement; RAP = research activities plan; RI = Rhode Island; SAP = site assessment plan; SC = South Carolina; VA = Virginia

Table D2-2. Offshore wind development activities on the U.S. East Coast: projects and assumptions (part 2, seabed/anchoring disturbance and scour protection) November 2023

Region	Lease/Project/Lease Remainder	Status	Geographic Analysis Area (X denotes lease area is within or overlaps analysis area)[1]								Estimated Foundation Number[2]	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]
			Air Quality and GHG Emissions, Water Quality, Navigation	Benthic Resources	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Coastal Habitat	Demographics, Environmental Justice	Marine Archaeology	Other Marine Uses (excluding research surveys & navigation)	Visual, Recreation & Tourism										
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA	X	X	X		X	X	X	X	211	21	289	294	294	294	714	282	301	301
NY/NJ	Atlantic Shores North, OCS-A 0549	COP	X	X	X		X	X	X	X	165	25	190	3,393	393	393	416	2,162	301	301
NY/NJ	Ocean Wind 1, OCS-A 0498	COP Approved (ROD issued 2023), PPA	X	X	X		X	X	X	X	101	4	84	1,935[12]	78	94	19	1,850[13]	144	77
NY/NJ	Ocean Wind 2, OCS-A 0532	PPA	X	X	X		X	X	X	X	111	17	130	170	24	24	336	1,631	219	0
NY/NJ	Empire Wind 1, part of OCS-A 0512	COP, PPA	X	X	X		X	X	X	X	58	1	52	368	37	33	9	534	82	26
NY/NJ	Empire Wind 2, part of OCS-A 0512	COP, PPA	X	X	X		X	X	X	X	91	2	82	360	24	32	9	633	129	32
NY/NJ	NY Bight lease areas (OCS-A 0537, OCS-A 0538, OCS-A 0539, OCS-A 0541, OCS-A 0542, and OCS-A 0544)		X	X	X	X	X	X	X	X	1,125[14]	NA	NA	28,137[15]	NA	NA	NA	25,120[16]	NA	NA
	Total NY/NJ Leases										**1,862**	**70**	**827**	**34,657**	**950**	**870**	**1,503**	**32,212**	**1,174**	**737**
	Total MA, RI, DE, MD, NC, SC, VA Leases										**1,859**	**297**	**3,980**	**142,660**	**2,819**	**1,047**	**3,975**	**37,682**	**2,197**	**671**
	OCS Total										**3,721**	**367**	**4,807**	**177,317**	**3,769**	**1,917**	**5,478**	**69,894**	**3,371**	**1,408**

[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 OSSs and met towers. 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 is 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.
[12] Includes disturbance from offshore export cables and substation interconnector cables. Assumes an 82-foot-wide corridor would be disturbed per cable, based on the Ocean Wind 1 COP.
[13] Assumes an 82-foot-wide corridor would be disturbed, based on the Ocean Wind 1 COP.
[14] Total foundations are the anticipated number of WTG and OSS across all six NY Bight lease areas provided by the lessees. These are estimates used for analysis purposes only and do not reflect the actual number of foundations that may be constructed in each NY Bight lease area.
[15] Calculated based on maximum length of export cable of 1,772 miles and 131 maximum feet (width) of disturbance from the RPDE.
[16] Calculated based on maximum length of interarray cable of 1,582 miles and 131 maximum feet (width) of disturbance from the RPDE.
NJ = New Jersey; NA = not applicable; NY = New York; PPA = Power Purchase Agreement

Table D2-3. Offshore wind development activities on the U.S. East Coast: projects and assumptions (part 3, gallons of coolant, oils, lubricants, and diesel fuel) November 2023

Region	Lease/Project/Lease Remainder	Status	Geographic Analysis Area (X denotes lease area is within or overlaps analysis area)[1]								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)
			Air Quality and GHG Emissions, Water Quality, Navigation	Benthic Resources	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates,	Coastal Habitat	Demographics, Environmental Justice	Marine Archaeology	Other Marine Uses (excluding research surveys & navigation)	Visual, Recreation & Tourism						
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA	X	X	X		X	X	X	X	820,000	10,300	606,200	370,050	80,000	75,000
NY/NJ	Atlantic Shores North OCS-A 0549[2]	COP	X	X	X		X	X	X	X	643,700	9,150	530,817	557,850	62,800	557,850
NY/NJ	Ocean Wind 1, OCS-A 0498	COP Approved (ROD issued 2023), PPA	X	X	X		X	X	X	X	39,690	4,488	187,964	238,707	77,714	158,502
NY/NJ	Ocean Wind 2, OCS-A 0532[3]	PPA	X	X	X		X	X	X	X	330,561	2,992	391,774	185,452	44,677	5,225
NY/NJ	Empire Wind 1, part of OCS-A 0512	COP, PPA, SAP	X	X	X		X	X	X	X	49,704	-	236,037	158,503	-	7,925
NY/NJ	Empire Wind 2, part of OCS-A 0512	COP, PPA, SAP	X	X	X		X	X	X	X	78,480	-	273,690	158,503	-	7,925
NY/NJ	NY Bight lease areas (OCS-A 0537, OCS-A 0538, OCS-A 0539, OCS-A 0541, OCS-A 0542, and OCS-A 0544)		X	X	X	X	X	X	X	X	NA	NA	NA	NA	NA	NA
	Total NY/NJ Leases										**1,962,135**	**26,930**	**2,226,482**	**1,669,065**	**265,191**	**812,427**
	Total MA, RI, DE, MD, NC, SC, VA Leases										**2,222,533**	**45,058**	**5,737,835**	**4,795,650**	**1,349,665**	**802,307**
	OCS Total										**4,184,668**	**71,988**	**7,964,317**	**6,464,715**	**1,614,856**	**1,614,734**

[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 Atlantic Shores South based on number of turbines and OSSs; with assumption of three large OSS.
[3] Quantities of coolant, oil and lubricants, and diesel fuel are scaled to Ocean Wind 1 based on number of turbines and OSSs.
ESP = electrical service platform; NA = not applicable; NJ = New Jersey; NY = New York; PPA = Power Purchase Agreement

Table D2-4. Offshore wind development activities on the U.S. East Coast: projects and assumptions (part 4, OCS construction and operation emissions) November 2023

Region	Lease/Project/Lease Remainder	Status	Air Quality and GHG Emissions Geographic Analysis Area[1]	2023	2024	2025	2026	2027	2028	2029	2030	Beyond 2030
Nitrogen oxides (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	1	779	3,330	3,597	2,422	479	479	479	479
NY/NY	Ocean Wind 1, OCS-A 498	COP Approved (ROD issued 2023), PPA, SAP	X	5	11,168	159	159	159	159	159	159	159
NY/NY	Ocean Wind 2, OCS-A 0532	PPA	X	--	--	--	2,531	2,531	2,531	2,531	2,531	180
NY/NY	Atlantic Shores North, OCS-A 0499 remainder	SAP	X	--	--	--	1,312	1,312	1,312	1,312	1,312	254
NY/NY	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	--	2,089	2,089	2,089	2,089	519	519	519	519
NY/NY	NY Bight lease areas (OCS-A 0537, OCS-A 0538, OCS-A 0539, OCS-A 0541, OCS-A 0542, and OCS-A 0544)		X	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 5,221 Six Projects: 31,325	One Project: 5,221 Six Projects: 31,325	One Project: 5,221 Six Projects: 31,325	One Project: 5,221 Six Projects: 31,325	One Project: 5,221 Six Projects: 31,325	One Project: 227 Six Projects: 1,362
	Total Air Quality Analysis Area			6	14,036	5,578	41,013	39,838	36,325	36,325	36,325	2,953
Volatile organic compounds (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	0	31	168	150	103	21	21	21	21
NY/NY	Ocean Wind 1, OCS-A 498	COP Approved (ROD issued 2023), PPA, SAP	X	0	293	4	4	4	4	4	4	4
NY/NJ	Ocean Wind 2, OCS-A 0532	PPA	X	--	--	--	66	66	66	66	66	4
NY/NJ	Atlantic Shores North, OCS-A 0499 remainder	SAP	X	--	--	--	25	25	25	25	25	7
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	--	40	40	40	40	9	9	9	9
NY/NJ	NY Bight lease areas (OCS-A 0537, OCS-A 0538, OCS-A 0539, OCS-A 0541, OCS-A 0542, and OCS-A 0544)		X	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 151 Six Projects: 906	One Project: 151 Six Projects: 906	One Project: 151 Six Projects: 906	One Project: 151 Six Projects: 906	One Project: 151 Six Projects: 906	One Project: 5 Six Projects: 30
	Total Air Quality Analysis Area			0	364	212	1,192	1,145	1,031	1,031	1,031	75
Carbon monoxide (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	0	185	816	920	721	228	228	228	228
NY/NY	Ocean Wind 1, OCS-A 498	COP Approved (ROD issued 2023), PPA, SAP	X	3	2,154	40	40	40	40	40	40	40
NY/NJ	Ocean Wind 2, OCS-A 0532	PPA	X	--	--	--	489	489	489	489	489	45
NY/NJ	Atlantic Shores North, OCS-A 0499 remainder	SAP	X	--	--	--	316	316	316	316	316	95

Region	Lease/Project/Lease Remainder	Status	Air Quality and GHG Emissions Geographic Analysis Area[1]	2023	2024	2025	2026	2027	2028	2029	2030	Beyond 2030
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	--	503	503	503	503	121	121	121	121
NY/NJ	NY Bight lease areas (OCS-A 0537, OCS-A 0538, OCS-A 0539, OCS-A 0541, OCS-A 0542, and OCS-A 0544)		X	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 1,111 Six Projects: 6,666	One Project: 1,111 Six Projects: 6,666	One Project: 1,111 Six Projects: 6,666	One Project: 1,111 Six Projects: 6,666	One Project: 1,111 Six Projects: 6,666	One Project: 52 Six Projects: 312
	Total Air Quality Analysis Area			3	2,842	1,359	8,934	8,735	7,860	7,860	7,860	842
Particulate matter, 10 microns or less (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	0	19	91	108	75	13	13	13	13
NY/NY	Ocean Wind 1, OCS-A 498	COP Approved (ROD issued 2023), PPA, SAP	X	0	365	6	6	6	6	6	6	6
NY/NJ	Ocean Wind 2, OCS-A 0532	PPA	X	--	--	--	83	83	83	83	83	6
NY/NJ	Atlantic Shores North, OCS-A 0499 remainder	SAP	X	--	--	--	44	44	44	44	44	13
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	--	70	70	70	70	17	17	17	17
NY/NJ	NY Bight lease areas (OCS-A 0537, OCS-A 0538, OCS-A 0539, OCS-A 0541, OCS-A 0542, and OCS-A 0544)		X	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 105 Six Projects: 632	One Project: 105 Six Projects: 632	One Project: 105 Six Projects: 632	One Project: 105 Six Projects: 632	One Project: 105 Six Projects: 632	One Project: 5 Six Projects: 30
	Total Air Quality Analysis Area			0	454	167	943	910	794	794	794	85
Particulate matter, 2.5 microns or less (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	0	19	89	105	73	12	12	12	12
NY/NY	Ocean Wind 1, OCS-A 498	COP Approved (ROD issued 2023), PPA, SAP	X	0	349	5	5	5	5	5	5	5
NY/NJ	Ocean Wind 2, OCS-A 0532	PPA	X	--	--	--	79	79	79	79	79	6
NY/NJ	Atlantic Shores North, OCS-A 0499 remainder	SAP	X	--	--	--	43	43	43	43	43	13
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	--	68	68	68	68	16	16	16	16
NY/NJ	NY Bight lease areas (OCS-A 0537, OCS-A 0538, OCS-A 0539, OCS-A 0541, OCS-A 0542, and OCS-A 0544)		X	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 101 Six Projects: 605	One Project: 101 Six Projects: 605	One Project: 101 Six Projects: 605	One Project: 101 Six Projects: 605	One Project: 101 Six Projects: 605	One Project: 4 Six Projects: 24
	Total Air Quality Analysis Area			0	436	162	905	873	760	760	760	76
Sulfur dioxide (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	0	16	75	68	43	7	7	7	7

Region	Lease/Project/Lease Remainder	Status	Air Quality and GHG Emissions Geographic Analysis Area[1]	2023	2024	2025	2026	2027	2028	2029	2030	Beyond 2030
NY/NY	Ocean Wind 1, OCS-A 498	COP Approved (ROD issued 2023), PPA, SAP	X	0	115	1	1	1	1	1	1	1
NY/NJ	Ocean Wind 2, OCS-A 0532	PPA	X	--	--	--	26	26	26	26	26	1
NY/NJ	Atlantic Shores North, OCS-A 0499 remainder	SAP	X	--	--	--	4	4	4	4	4	1
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	--	7	7	7	7	1	1	1	1
NY/NJ	NY Bight lease areas (OCS-A 0537, OCS-A 0538, OCS-A 0539, OCS-A 0541, OCS-A 0542, and OCS-A 0544)		X	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 203 Six Projects: 1,217	One Project: 203 Six Projects: 1,217	One Project: 203 Six Projects: 1,217	One Project: 203 Six Projects: 1,217	One Project: 203 Six Projects: 1,217	One Project: 9 Six Projects: 54
	Total Air Quality Analysis Area			0	138	83	1,323	1,298	1,257	1,257	1,257	65
Carbon dioxide (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	280	48,380	202,661	215,973	160,035	45,918	45,918	45,918	45,918
NY/NY	Ocean Wind 1, OCS-A 498	COP Approved (ROD issued 2023), PPA, SAP	X	3,539	652,774	11,752	11,752	11,752	11,752	11,752	11,752	11,752
NY/NJ	Ocean Wind 2, OCS-A 0532	PPA	X	--	--	--	148,675	148,675	148,675	148,675	148,675	13,311
NY/NJ	Atlantic Shores North, OCS-A 0499 remainder	SAP	X	--	--	--	87,516	87,516	87,516	87,516	87,516	26,349
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP	X	--	139,357	139,357	139,357	139,357	33,566	33,566	33,566	33,566
NY/NJ	NY Bight lease areas (OCS-A 0537, OCS-A 0538, OCS-A 0539, OCS-A 0541, OCS-A 0542, and OCS-A 0544)		X	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 0 Six Projects: 0	One Project: 306,793 Six Projects: 1,840,758	One Project: 306,793 Six Projects: 1,840,758	One Project: 306,793 Six Projects: 1,840,758	One Project: 306,793 Six Projects: 1,840,758	One Project: 306,793 Six Projects: 1,840,758	One Project: 12,505 Six Projects: 75,030
	Total Air Quality Analysis Area			3,819	840,511	353,770	2,444,032	2,388,094	2,168,186	2,168,186	2,168,186	205,926

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

Note: Emissions for NY Bight were calculated based upon RPDE values using the BOEM Wind Tool model. Emissions for NY Bight Six Projects were calculated as six times the values for One Project. Based on input from the lessees, the calculated emissions for Six Projects are likely to be conservative (tending to overestimate emissions). Emissions for Ocean Wind 2 and Atlantic Shores North are scaled from Ocean Wind 1 and Atlantic Shores South, respectively, based on number of turbines and estimated construction schedule.

NJ = New Jersey; NY = New York; PPA = Power Purchase Agreement

Attachment D3: References Cited

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Appendix E: Analysis of Incomplete and Unavailable Information

In accordance with Section 1502.21 of the Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA), when an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement (EIS) and when information is incomplete or unavailable, the agency shall make clear that such information is lacking. When incomplete or unavailable information was identified, the Bureau of Ocean Energy Management (BOEM) considered whether the information was relevant to the assessment of impacts and essential to its analysis of alternatives based upon the resource analyzed. If essential to making a reasoned choice among the alternatives, BOEM considered whether it was possible to obtain the information and if the cost of obtaining it was exorbitant. If it could not be obtained or if the cost of obtaining it was exorbitant, BOEM applied acceptable scientific methodologies to inform the analysis in light of this incomplete or unavailable information.

Because the Programmatic EIS (PEIS) is being prepared prior to the submittal of Construction and Operations Plans (COPs), the specific locations of wind turbine generators (WTGs) and offshore substations (OSSs), interarray cables, offshore and onshore export cable routes, cable landfall locations, and onshore facility locations for the New York Bight (NY Bight) projects are not known at this time. Therefore, site-specific impacts associated with the construction, operations and maintenance (O&M), and conceptual decommissioning of these facilities that deviate from the broad-scale analysis presented in the PEIS will be analyzed in subsequent COP-specific NEPA documents. Because the analysis in the Draft PEIS is intended to be programmatic in nature and because future site-specific NEPA analysis will be required for each COP, BOEM does not believe site-specific information on facility locations is essential to the reasoned choice among alternatives. The following sections present an analysis by resource topic of incomplete or unavailable information in the PEIS.

E.1 Incomplete or Unavailable Information Analysis for Resource Areas

E.1.1 Air Quality and Greenhouse Gas Emissions

BOEM expects that any action alternative would lead to reduced emissions regionally and a net improvement in regional air quality because offshore wind energy would displace a portion of the energy generated from fossil fuel combustion. Although a quantitative emissions inventory analysis of the region, and regional modeling of pollutant concentrations over the next 30 to 35 years would more accurately assess the overall impacts of the changes in emissions from the six NY Bight projects, regional air quality conditions would apply to the programmatic alternatives and subsequent project-specific alternatives alike. When specific projects are proposed and undergo Outer Continental Shelf (OCS) air quality permitting, the required air quality modeling will provide additional insight into regional air quality conditions. Construction cannot begin on any project before an air permit is acquired. As such, the analysis provided in the Draft PEIS is sufficient to support sound scientific judgments and informed decision-making related to the use of the offshore portions of the NY Bight lease areas and offshore export cable route corridors. Therefore, BOEM does not believe that there is incomplete or unavailable information on air quality that is essential to making a reasoned choice among alternatives.

E.1.2 Water Quality

At this early analysis stage, there is some inherent uncertainty regarding the impacts of the activities covered in the PEIS on water quality. However, the information that is available is appropriate for this programmatic level of analysis, and subsequent project-specific environmental analysis on water quality will be required for each individual COP before any construction activities may begin. Therefore, BOEM does not believe that there is incomplete or unavailable information that is essential to making a reasoned choice among alternatives for this PEIS.

E.1.3 Bats

Habitat use and distribution of bats vary between seasons and species; therefore, there will always be some level of incomplete information on the distribution and habitat use of bats in the offshore portions of the NY Bight lease areas. Additionally, surveying bat activity offshore provides challenges as limited methods have been developed and tested for surveying within this environment. No BOEM-issued guidance for bat surveys currently exists for renewable energy development on the OCS. However, an evaluation of scientific studies and available, relevant information was examined, including New York State Energy Research and Development Authority (NYSERDA) remote metocean data from two buoys in two of the NY Bight lease areas (see Section 3.5.1.1, *Description of the Affected Environment and Future Baseline Conditions*), to provide a baseline understanding of the presence, abundance, and seasonality of bats that may occur within the NY Bight lease areas.

Given the infancy of U.S. offshore wind development, there is some level of uncertainty regarding the potential collision risk to individual bats that may be present within the offshore portions of the NY Bight lease areas. However, sufficient information on collision risk to bats observed at land-based U.S. wind projects exists and was used to analyze and corroborate the potential for this impact as a result of WTG operations in the NY Bight lease areas. In addition, as described in Section 3.5.1, *Bats*, the likelihood of a bat encountering an operating WTG during migration is very low; therefore, the differences among alternatives with respect to bats for wind development in the NY Bight lease areas are expected to be small. As such, the analysis provided in the Draft PEIS is sufficient to support sound scientific judgments and informed decision-making related to distribution and use of the offshore portions of the NY Bight lease areas as well as to the potential for collision risk of bats. Consequently, BOEM does not believe that there is incomplete or unavailable information on bat resources that is essential to making a reasoned choice among alternatives.

E.1.4 Benthic Resources

Although there is uncertainty regarding the spatial and temporal distribution of benthic (faunal) resources and periods during which they might be especially vulnerable to disturbance, project-specific COP surveys of benthic resources for other nearby projects and a broad-scale study (Guida et al. 2017) provided a suitable basis for generally predicting the species, abundances, and distributions of benthic resources within the geographic analysis area. Uncertainty also exists regarding the impact of some impact-producing factors (IPFs) on benthic resources. For example, specific stimulus-response related to acoustics and electromagnetic fields (EMFs) is not well studied, although there is some emerging information from benthic monitoring at European wind facilities and the Block Island Wind Farm in the United States that allows for a broad understanding of the impacts. Similarly, specific secondary impacts, such as changes in diets throughout the food chain resulting from habitat modification and synergistic behavioral impacts from multiple IPFs, are not fully known. Again, results of benthic monitoring at European wind facilities and the Block Island Wind Farm in the United States provide general knowledge of the overall impacts of these IPFs combined, if not individually. Therefore, the analysis provided in the Draft PEIS is sufficient to support sound scientific judgments and informed decision-making related to the overall impacts. For these reasons, BOEM does not believe that there is incomplete or unavailable information on benthic resources that is essential to making a reasoned choice among alternatives.

E.1.5 Birds

Habitat use and distribution of birds vary between seasons, species, and years; therefore, there will always be some level of incomplete information on the distribution and habitat use of birds in the offshore portions of the geographic analysis area, including the NY Bight lease areas. Additionally, given the infancy of U.S. offshore wind development, there will be some level of uncertainty regarding the potential for collision risk and avoidance behaviors for some of the bird species that may be present within the offshore portions of the geographic analysis area. For the Draft PEIS, publicly available avian survey data (e.g., NYSERDA remote metocean data from two buoys), marine life data and analysis team (MDAT) modeling, and NYSERDA aerial digital avian survey data that covers most of the NY Bight lease areas were used to describe bird presence and inform the analysis of potential adverse impacts on bird resources in the offshore environment.

Bird mortality data are available for onshore wind facilities and, based on several assumptions regarding their applicability to offshore environments, were used to inform the analysis of bird mortality associated with the offshore WTGs analyzed in the Draft PEIS. However, uncertainties exist regarding the use of the onshore bird mortality rate to estimate the offshore bird mortality rate due to differences in species groups present and life history and behavior of species as well as differences in the offshore marine environment compared to onshore habitats.

Modeling is commonly used to predict the potential mortality rates for bird species in Europe and the United States (BOEM 2015, 2021). Due to inherent data limitations, these models often represent only a subset of species potentially present. Still, the datasets used by BOEM (e.g., MDAT) to assess the potential for exposure of birds to the NY Bight lease areas represent the best available data and provide context at both local and regional scales. Furthermore, sufficient and relevant information on collision risk and avoidance behaviors observed in related species at European offshore wind projects is available and was used to analyze and corroborate the potential for these impacts as a result of wind farm operations in the NY Bight lease areas (e.g., Skov et al. 2018). As such, the analysis provided in the Draft

PEIS is sufficient to support sound scientific judgments and informed decision-making related to distribution and use of the offshore portions of the geographic analysis area as well as to the potential for collision risk and avoidance behaviors in bird resources. Furthermore, the similarity between the different alternatives does not render any of this incomplete and unavailable information essential to making a reasoned choice among alternatives. Therefore, BOEM does not believe that there is incomplete or unavailable information on birds that is essential to making a reasoned choice among alternatives.

E.1.6 Coastal Habitat and Fauna

Although the preferred habitats of terrestrial and coastal fauna are generally known, specific data on abundances and distributions within the geographic analysis area of various fauna within these habitats are likely to remain unknown without site-specific surveys. However, the species inventories and other general information about the area provide an adequate basis for evaluating the fauna likely to inhabit the onshore geographic analysis area. Additionally, the onshore activities expected to be proposed involve only common, industry-standard activities for which impacts are generally understood. Therefore, BOEM believes that the analysis provided in the Draft PEIS is sufficient to make a reasoned choice among the alternatives in terms of coastal habitat and fauna.

E.1.7 Finfish, Invertebrates, and Essential Fish Habitat

Although there is some uncertainty regarding the spatial and temporal distribution of finfish and invertebrate resources and periods during which they might be especially vulnerable to disturbance, project-specific COP aquatic resource surveys for other nearby projects and a broad-scale study (Guida et al. 2017) provided a suitable basis for general predictions of finfish and invertebrate resources with respect to species, densities, and distributions within the geographic analysis area. Additional information related to Endangered Species Act (ESA) listed species are being addressed in the Programmatic Framework Biological Assessment (BA). Future project-specific BAs and essential fish habitat (EFH) assessments will be prepared for each offshore wind project and will provide additional information about impacts on ESA-listed species and EFH. While impacts on specific finfish and invertebrate species are not anticipated to vary from the general impacts provided in the Draft PEIS, specific impact discussions for ESA-listed species and EFH will be provided in these assessments.

Uncertainty also exists regarding the impact of some IPFs on invertebrate resources, such as the effects of EMFs and underwater noise (e.g., generated from pile-driving activities). The available information on invertebrate sensitivity to EMF is equivocal (Hutchinson et al. 2020), and sensitivity to sound pressure and particle motion effects is not well understood for many species, nor are synergistic or antagonistic impacts from multiple IPFs. Similarly, specific secondary impacts such as changes in diets throughout the food chain resulting from habitat modification are not well known for finfish and invertebrates. Where applicable, the analysis drew upon information in the available literature and an increasing number of monitoring and research studies related to wind development, other undersea development, or artificial reefs in Europe and the United States, several of which were recently drafted or published. These monitoring studies help provide a broad understanding of the overall impacts of the combined IPFs, if not individually.

For these reasons, the information provided in the Draft PEIS is sufficient to support sound scientific judgments and informed decision-making related to the overall impacts. Therefore, BOEM does not believe that there is incomplete or unavailable information on finfish, invertebrate, and EFH resources that is essential to making a reasoned choice among alternatives.

E.1.8 Marine Mammals

The National Marine Fisheries Service (NMFS) has summarized the most current information about marine mammal population status, occurrence, and use of the region in its stock status reports for the Atlantic OCS and Gulf of Mexico (Waring et al. 2015; Hayes et al. 2019, 2020, 2021, 2022; Palka et al. 2021, 2017). These studies provided a suitable basis for predicting the species, abundances, and distributions of marine mammals in the geographic analysis area. However, population trend data from NMFS are unavailable for 32 species (of which only 7 are common or regular in the NY Bight area), and annual human-caused mortality is unknown for two species (see Table 3.5.6-1 in the Draft PEIS). Most species lacking population trend data are offshore species, such as blue whale, fin whale, and non-porpoise odontocetes (e.g., beaked whales and dolphins). As a result, there is uncertainty regarding how the NY Bight lease area project activities and cumulative effects may affect these populations. In addition to species distribution information, effects of some IPFs on marine mammals are also uncertain or ambiguous, as described below.

Potential effects of EMF have not been scaled to consider impacts on marine mammal populations or their prey in the geographic analysis area (Taormina et al. 2018). The widespread ranges of marine mammals and difficulty obtaining permits make experimental studies challenging. As a result, few scientific studies have been conducted that examine the effects of altered EMF on marine mammals. Scientific studies summarized by Normandeau et al. (2011) demonstrate that marine mammals are sensitive to, and can detect, small changes in magnetic fields (Section 3.5.6, *Marine Mammals*), but potential impacts would likely only occur within a few feet of cable segments. Therefore, the current literature does not support a conclusion that EMF could lead to changes in behavior that would cause significant adverse effects on marine mammal populations.

The behavioral effects of anthropogenic noises on marine mammals are increasingly being studied. However, behavioral responses vary depending on a variety of factors such as life stage, previous experience, and current behavior (e.g., feeding, nursing), and they are therefore difficult to predict. In addition, the current NMFS disturbance criteria apply a single threshold for all marine mammals for impulsive noise sources and do not consider the overall duration, exposure, or frequency content of the sound to account for species-dependent hearing acuity. While elevated underwater sound could startle or displace animals, behavioral responses are not necessarily predictable from received levels alone (Southall et al. 2007).

In addition, research regarding the potential behavioral effects of pile-driving noise has generally focused on harbor porpoises and seals; studies that examine the behavioral responses of baleen whales to pile-driving activities are absent from the literature. Of the available research, most studies (e.g., Brandt et al. 2016; Dahne et al. 2013; Benhemma-Le Gall et al. 2021) conclude that, although pile-driving activities could cause avoidance behaviors or disruption of feeding activities, individual harbor porpoises and seals would likely return to normal behaviors once the activity had stopped; this is unknown for baleen whales and other marine mammals. Uncertainty remains regarding the long-term cumulative acoustic impacts associated with multiple pile-driving projects that may occur over several years. An acoustic narrative in Appendix J, *Introduction to Sound and Acoustic Assessment*, Section, J.4, *Acoustic Assessment,* drawing on the hypothetical case study of two wind farms constructed in New England, provides further insight about the relative risk of multi-project development on select marine mammal species and the factors that should be considered in reducing acoustic impacts. This also applies to other project activities (e.g., vessel traffic, high-resolution geophysical (HRG) surveys, geotechnical drilling, dredging activities) that may elicit behavioral reactions in marine mammals. As a result, it is not possible to predict with certainty the potential long-term behavioral effects on marine mammals from the project-related pile-driving or other activities, as well as ongoing concurrent and cumulative pile-driving and other activities.

The Draft PEIS used the best available information when considering behavioral effects related to underwater noise to address this uncertainty. For the assessment of large baleen whales, studies on other impulsive noises (e.g., airguns) were used to inform the potential behavioral reactions to pile-driving noise (Southall et al. 2021, McCauley et al. 1998, Johnson 2002, Richardson et al. 1999). Monitoring studies would provide insight into species-specific behavioral reactions to project-generated underwater noise. Long-term monitoring of concurrent and multiple projects could inform the understanding of long-term effects and subsequent consequences from cumulative underwater noise activities on marine mammal populations.

There is a lack of research regarding the responses of large whale species to extensive networks of new structures due to the novelty of offshore wind development on the Atlantic OCS. Although new structures are anticipated from multiple offshore wind projects in the NY Bight area (see Chapter 2, *Alternatives*), it is expected that spacing would allow large whales to access areas within and between wind facilities. No physical obstruction of marine mammal migration routes or habitat areas are anticipated, but it is unknown if avoidance of offshore wind lease areas due to new structures would occur. Additionally, while there is some uncertainty regarding how hydrodynamic changes around foundations may affect prey availability, these changes are expected to have limited impacts on the local conditions around WTG foundations. The potential consequences of these impacts on marine mammals are unknown. Monitoring studies would provide insight into species-specific avoidance behaviors and other potential behavioral reactions to project structures.

At present, the Draft PEIS has no basis to conclude that these IPFs (i.e., noise, EMF, presence of structures) would result in significant adverse behavioral impacts on marine mammal populations.

BOEM determined that the overall costs of obtaining the missing information for or addressing these uncertainties are exorbitant, or the means to obtain it are unknown. Therefore, to address these gaps, BOEM extrapolated or drew assumptions from known information for similar species and studies using acceptable scientific methodologies to inform the analysis considering this incomplete or unavailable information, as presented in Section 3.5.6, *Marine Mammals*. The information and methods used to predict potential impacts on marine mammals represent the best available information, and the information provided in the Draft PEIS is sufficient to support sound scientific judgments and informed decision-making. Therefore, BOEM does not believe that there is incomplete or unavailable information on marine mammal resources that is essential to making a reasoned choice among alternatives.

E.1.9 Sea Turtles

There are limited data and information on the distribution and abundance of sea turtle species that occur in the Atlantic OCS and the NY Bight lease areas. Four species of sea turtles are considered in the PEIS: the leatherback sea turtle, loggerhead sea turtle, Kemp's ridley sea turtle, and green sea turtle. A digital aerial baseline survey of marine wildlife was conducted off the southern shores of New York and northern shores of New Jersey by NYSERDA. The survey boundaries overlap with the majority of the NY Bight lease areas. Sea turtle abundance increased from the coastal zones out to the shelf break. Densities of sea turtles were most abundant in the summer months (Normandeau Associates Inc. and APEM Inc. 2021a, 2021b).

The Programmatic Framework NMFS BA will provide a thorough overview of the available information about potential species occurrence and exposure to NY Bight project-related IPFs. The studies summarized therein provide a suitable basis for predicting potential species occurrence, relative abundance, and probable distribution of sea turtles in the geographic analysis area.

Some uncertainty exists about the effects of certain IPFs on sea turtles and their habitats. The effects of EMF on sea turtles are not completely understood. However, the available relevant information is summarized in the BOEM-sponsored report by Normandeau et al. (2011) and a more recent review by Bilinski (2021). Although the thresholds for EMF disturbing various sea turtle behaviors are not known, the evidence suggests that impacts may only occur on hatchlings over short distances, and no adverse effects on sea turtles have been documented to occur from the numerous submarine power cables around the world.

There is also uncertainty about sea turtle responses to NY Bight project construction activities, and data are not available to evaluate potential changes to movements of juvenile and adult sea turtles due to elevated suspended sediments. However, although some exposure may occur, total suspended solid impacts would be limited in magnitude and duration and would occur within the range of exposures periodically experienced by these species. On this basis, any resulting impact on sea turtle behavior due to sediment plumes would likely be too small to be biologically meaningful, and no adverse impacts would be expected (NOAA 2020). Some potential exists for sea turtle displacement, but it is unclear if this would result in adverse impacts (e.g., because of lost foraging opportunities or increased exposure to potentially fatal vessel interactions). Additionally, it is currently unclear whether concurrent construction of multiple projects, increasing the extent and intensity of impacts over a shorter duration, or spreading out project construction with lower intensity impacts over multiple years would result in the least potential harm to sea turtles.

There is also uncertainty regarding the cumulative acoustic impacts associated with pile-driving activities. Information on sea turtle hearing is limited, and there are some discrepancies between hearing range determinations. Cumulative acoustic impacts associated with pile-driving activities are unknown, including whether sea turtles affected by construction activities would resume normal feeding, migrating, or breeding behaviors once daily pile-driving activities cease, or if secondary impacts would continue. Under the planned activities scenario, individual sea turtles may be exposed to acoustic impacts from multiple offshore wind projects in a single day or from one or more projects over the course of multiple days. Although the consequences of these exposure scenarios have been analyzed with the best available information, some level of uncertainty remains due to the lack of observational data on species' responses to pile-driving activities.

Some uncertainty exists regarding the potential for sea turtle responses to Federal Aviation Administration (FAA) hazard lights and navigation lighting associated with offshore wind development. Specific projects would limit lighting on WTGs and OSSs to minimum levels required by regulation for worker safety, navigation, and aviation. Although sea turtles' sensitivity to these minimal light levels is unknown, sea turtles do not appear to be adversely affected by oil and gas platform operations, which produce far more artificial light than offshore wind structures (BOEM 2019). The placement of new structures would be far from known nesting beaches, so no impacts on nesting female or hatchling sea turtles are anticipated.

Considerable uncertainty exists about how sea turtles would interact with the long-term changes in biological productivity and community structure resulting from the reef effect of offshore wind farms across the geographic analysis area. Artificial reef and hydrodynamic impacts could influence predator-prey interactions and foraging opportunities in ways that influence sea turtle behavior and distribution. Also, the extent of sea turtle entanglement on artificial reefs and shipwrecks is not captured in sea turtle stranding records, and the significance and potential scale of sea turtle entanglement in lost fishing gear are not quantified. These impacts are expected to interact with the ongoing influence of climate change on sea turtle distribution and behavior over broad spatial scales, but the nature and significance of these interactions are not predictable. BOEM anticipates that ongoing monitoring of offshore energy structures will provide some useful insights into these synergistic effects.

BOEM considered the level of effort required to address the uncertainties for sea turtles and determined that the methods necessary to do so are lacking or the associated costs would be exorbitant. Therefore, where appropriate, BOEM inferred conclusions about the likelihood of potential biologically significant impacts from available information for similar species and situations to inform the analysis considering this incomplete or unavailable information. These methods are described in greater detail in Section 3.5.7, *Sea Turtles*. Therefore, the analysis provided is sufficient to support sound scientific judgments and informed decision-making about the NY Bight projects with respect to impacts on sea turtles. For these reasons, BOEM does not believe that there is incomplete or unavailable information on sea turtles that is essential to making a reasoned choice among alternatives.

E.1.10 Wetlands

At this early analysis stage, there is some inherent uncertainty regarding the impacts of the activities covered in the PEIS on wetlands. However, the information that is available is appropriate for this programmatic level of analysis, and subsequent project-specific environmental analysis on wetlands will be required for each individual COP before any construction activities may begin. Therefore, BOEM does not believe that there is incomplete or unavailable information that is essential to making a reasoned choice among alternatives for this PEIS.

E.1.11 Commercial Fisheries and For-Hire Recreational Fishing

Fisheries are managed in the context of an incomplete understanding of fish stock dynamics and effects of environmental factors on fish populations. The commercial fisheries information used in this assessment has limitations. For example, vessel trip report data are only an approximation because this information is self-reported and may not account for all trips. The vessel trip report data also do not include all commercial fishing operations that may be affected by offshore wind development in the NY Bight lease areas and only represent vessel logbook data for species managed by the Greater Atlantic Regional Fisheries Office. While these data include incidental catch of Atlantic menhaden, highly migratory species, or species managed by the NMFS Southeast Regional Office (e.g., wahoo and mahi mahi), when targeting other species, they are not specifically identified as a subset of total catch of these species within the NY Bight lease areas. Additionally, available historical data lack consistency, making comparisons challenging.

Vessel monitoring system (VMS) data are also limited, with a number of factors contributing to their limitations.

- VMS coverage is not universal for all fisheries, with some fisheries (summer flounder, scup, black sea bass, bluefish, American lobster, spiny dogfish, skate, whiting, and tilefish) not covered at all by VMS.
- There is limited historical coverage for most fisheries (e.g., monkfish is optional and elective on a yearly basis, 2005 or earlier for herring, 2006 for groundfish and scallops, 2008 for surfclams/ocean quahogs, 2014 for mackerel, and 2016 for longfin squid/butterfish).
- Trip declaration does not necessarily correspond to actual operation.
- Hourly position pings limit area resolution based on speed.
- Fishing time/location can be mis-estimated by operational assumptions (speed and direction) that are affected by externalities (weather, sea state, mechanical issues).
- Catch data are limited for where there is no information on catch rates, retained catch composition is limited to target species and some bycatch species, and the data are not universal.
- Catch information is for the full trip, not sub-trips.

- Not all information is collected from all fisheries (gear type).

However, these data represent the best available data, and sufficient information exists to support the findings presented in the Draft PEIS.

A second limitation is that recent annual revenue for for-hire recreational fishing in the NY Bight lease areas is not available. NMFS completed planning-level assessments of revenues from recreational party and charter vessels for each of the six lease areas (NMFS 2022a–f), but the assessments do not include detailed information on revenues from for-hire recreational fishing charters. However, BOEM does not believe that there is incomplete or unavailable information on commercial fisheries and for-hire recreational fishing resources that is essential to making a reasoned choice among alternatives.

E.1.12 Cultural Resources

At this stage of analysis, BOEM does not have enough information available from the lessees and their COPs or Project Design Envelopes (PDEs) to delineate either a cultural resources geographic analysis area or Programmatic Area of Potential Effects (APE) that would fully encompass all areas that may be subject to potential effects from NY Bight offshore wind project development. Specific areas associated with anticipated NY Bight offshore wind project development but excluded from delineation of the NY Bight Draft PEIS cultural resources geographic analysis area and Programmatic APE are:

- Any other offshore areas, aside from the six NY Bight lease areas, potentially physically affected by seabed-disturbing activities (i.e., other marine areas in which temporary or permanent construction or staging areas are proposed to occur, such as offshore export cable route corridors and horizontal directional drilling [HDD] locations, which may have physical impacts on cultural resources).
- All onshore areas potentially physically affected by ground-disturbing activities (i.e., terrestrial areas in which temporary or permanent construction or staging areas are proposed to occur, such as onshore export cable route corridors, substations, or HDD locations, which may have physical impacts on cultural resources).
- Any other areas within the viewshed of offshore renewable energy structures measuring greater than 1,312 feet in height.
- Any other onshore areas potentially visually affected by the presence of onshore renewable energy structures (e.g., the viewshed from which onshore structures would be visible, such as onshore export cable routes, substations, or switching stations, and which may have visual impacts on cultural resources).

As discussed in Section 3.6.2, *Cultural Resources*, and Appendix I, *NHPA Section 106 Summary*, BOEM conducted background research to identify cultural resource types in the Programmatic APE. However, other cultural resources and cultural resource types subject to potential impacts and not identified in BOEM's background research are possible.

As part of compliance with federal and state requirements, offshore wind project applicants are required to conduct requisite cultural resource and historic property identification studies and commit to measures for avoiding, minimizing, or mitigating identified resources. BOEM will require each lessee to complete the requisite cultural resource technical studies per BOEM (2020) historic property identification guidelines including, but not limited to, the delineation of a preliminary APE (PAPE) per the COP PDE, completion of associated cultural resource and historic property identification efforts, assessment of potential effects, and development of potential avoidance, minimization, mitigation, and monitoring (AMMM) measures for identified historic properties. BOEM will then delineate the COP APE and assess the specific impacts on historic properties in the APE in COP-specific NEPA and National Historic Preservation Act (NHPA) documents.

BOEM considered the level of effort required to address the incomplete data described above for historic properties and determined that there is insufficient project definition to establish a comprehensive and sufficient cultural resources geographic analysis area that would account for all areas where project activities have the potential to result in impacts on marine cultural, terrestrial archaeological, or historic aboveground resources. Therefore, where appropriate, BOEM inferred conclusions about the likelihood of potential impacts from available information on cultural resource types likely to be present in the Programmatic APE to inform the analysis in light of this incomplete or unavailable information. These methods are described in greater detail in Section 3.6.2 and Appendix I. Therefore, the analysis provided is sufficient to support sound judgments and informed decision-making about the alternatives with respect to their impacts on cultural resources. For these reasons, BOEM does not believe that there is incomplete or unavailable information on cultural resources that is essential to making a reasoned choice among alternatives at this stage.

E.1.13 Demographics, Employment, and Economics

At this early analysis stage, there is some inherent uncertainty regarding the impacts of the activities covered in the PEIS on demographics, employment, and economics. However, no specific incomplete or unavailable information related to the analysis of impacts on demographics, employment, and economics was identified.

E.1.14 Environmental Justice

Evaluations of impacts on environmental justice communities rely on the assessment of impacts on other resources. As a result, incomplete or unavailable information related to other resources, as described in this appendix, also affects the completeness of the analysis of impacts on environmental justice communities.

As discussed in other sections, BOEM has determined that incomplete and unavailable resource information for environmental justice or for other resources on which environmental justice communities rely was either not relevant to assess reasonably foreseeable significant adverse impacts, was not essential to making a reasoned choice among alternatives, alternative data or methods could be used to predict potential impacts and provided the best available information, or the overall costs of obtaining the information were exorbitant or the means to do so were unknown. Therefore, the information provided in the Draft PEIS is sufficient to support sound scientific judgments and informed decision-making related to the proposed uses of the onshore and offshore portions of the geographic analysis area.

Meaningful engagement with communities with environmental justice concerns is an essential element of assessing environmental justice impacts. For the PEIS, BOEM held a series of quarterly environmental justice forums with federal and state partners and community-based organizations that serve environmental justice and underserved communities (https://www.boem.gov/renewable-energy/state-activities/new-york-new-jersey-offshore-wind-environmental-justice-forums). As BOEM receives COPs for NY Bight projects, additional engagement opportunities, which provide information on locations for offshore and onshore infrastructure, will support COP-specific reviews.

E.1.15 Land Use and Coastal Infrastructure

At this early analysis stage, there is some inherent uncertainty regarding the impacts of the activities covered in the PEIS on land use and coastal infrastructure. However, the information that is available is appropriate for this programmatic level of analysis, and subsequent project-specific environmental analysis on land use and coastal infrastructure will be required for each individual COP before any construction activities may begin. Therefore, BOEM does not believe that there is incomplete or unavailable information that is essential to making a reasoned choice among alternatives for this PEIS.

E.1.16 Navigation and Vessel Traffic

At this early analysis stage, there is some inherent uncertainty regarding the impacts of the activities covered in the PEIS on navigation and vessel traffic. However, the information that is available is appropriate for this programmatic level of analysis, and subsequent project-specific environmental analysis on navigation and vessel traffic will be required for each individual COP before any construction activities may begin. Therefore, BOEM does not believe that there is incomplete or unavailable information that is essential to making a reasoned choice among alternatives for this PEIS.

E.1.17 Other Uses

At this early analysis stage, there is some inherent uncertainty regarding the impacts of the activities covered in the PEIS on other uses, including marine minerals, national security and military use, aviation and air traffic, cables and pipelines, radar systems, and scientific research and surveys. However, the information that is available is appropriate for this programmatic level of analysis, and subsequent project-specific environmental analysis on other uses will be required for each individual COP before any construction activities may begin. Therefore, BOEM does not believe that there is incomplete or unavailable information that is essential to making a reasoned choice among alternatives for this PEIS.

E.1.18 Recreation and Tourism

At this early analysis stage, there is some inherent uncertainty regarding the impacts of the activities covered in the PEIS on recreation and tourism. However, the information that is available is appropriate for this programmatic level of analysis, and subsequent project-specific environmental analysis on recreation and tourism will be required for each individual COP before any construction activities may begin. Therefore, BOEM does not believe that there is incomplete or unavailable information that is essential to making a reasoned choice among alternatives for this PEIS.

E.1.19 Scenic and Visual Resources

At this early analysis stage, there is some inherent uncertainty regarding the impacts of the activities covered in the PEIS on scenic and visual resources. However, the information that is available is appropriate for this programmatic level of analysis, and subsequent project-specific environmental analysis on scenic and visual resources will be required for each individual COP before any construction activities may begin. Therefore, BOEM does not believe that there is incomplete or unavailable information that is essential to making a reasoned choice among alternatives for this PEIS.

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Appendix F: Assessment of Resources with Minor (or Lower) Impacts

If required for the Final Programmatic Environmental Impact Statement, this appendix will contain the analysis of resources with no greater than minor adverse impacts.

Appendix G: Mitigation and Monitoring

The Draft Programmatic Environmental Impact Statement (PEIS) assesses the potential physical, biological, socioeconomic, and cultural impacts that could result from the construction, operations and maintenance (O&M), and conceptual decommissioning of the six New York Bight (NY Bight) lease areas, as well as the change in those impacts that could result from adopting programmatic avoidance, minimization, mitigation, and monitoring (AMMM) measures. The Proposed Action (Alternative C) for the Draft PEIS is the adoption of programmatic AMMM measures that the Bureau of Ocean Energy Management (BOEM) may require as conditions of approval for activities proposed by lessees in Construction and Operations Plans (COPs) submitted for the six NY Bight lease areas unless the COP-specific National Environmental Policy Act (NEPA) analysis shows that implementation of such measures is not warranted or effective. BOEM may require additional or different measures based on subsequent, site-specific NEPA analysis or the parameters of specific COPs. The AMMM measures analyzed in the Draft PEIS under the Proposed Action are presented in Table G-1. Please note that not all of these AMMM measures are within BOEM's statutory and regulatory authority; those that are not may still be adopted and imposed by other governmental agencies.

BOEM identified the AMMM measures analyzed in the Draft PEIS from review of offshore wind COPs; COP environmental impact statements (EISs); scoping comment letters; input from cooperating and participating agencies, and Cooperating Tribal Governments; and through programmatic consultations under the Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, and the National Historic Preservation Act, as described in Appendix A, *Consultation and Coordination*. BOEM selected AMMM measures that would be applicable to more than one NY Bight lease area, are reasonable and enforceable, and allow for flexibility where appropriate. These AMMM measures are considered programmatic insofar as they may be applied to COPs for the six NY Bight lease areas, not because they necessarily will apply to COPs under BOEM's renewable energy program outside of the NY Bight lease areas.

Several of the AMMM measures included in this appendix have been previously applied as terms and conditions of COP approvals. These measures have a checkmark under the column titled "*Previously Applied as a COP Term and Condition"* in Table G-1. Measures that have not been previously applied as COP terms and conditions do not have a checkmark in this column.

The Record of Decision (ROD) for the PEIS will state which of the AMMM measures identified in Table G-1 BOEM has committed to adopting at the COP NEPA stage and those which BOEM has not committed to adopting, and why. During NEPA review of individual COPs, BOEM may identify AMMM measures that do not apply to a specific COP if it can be demonstrated that implementation is not warranted or effective. Additionally, BOEM may identify additional mitigation or monitoring measures during COP-specific NEPA review to further protect and monitor resources. The environmental decision document for each COP-specific NEPA review will describe the specific terms and conditions of the AMMM measures for which compliance is required (40 Code of Federal Regulations [CFR] 1505.3). All NY Bight lessees will be required to certify compliance with these terms and conditions, under 30 CFR

285.633(a). Furthermore, pursuant to 30 CFR 585.634(b), BOEM will periodically review the activities conducted under the approved COPs for the six NY Bight lease areas with the frequency and extent of the review based on the significance of any changes in available information and on onshore or offshore conditions affecting, or affected by, the activities conducted under the COPs.

Monitoring may be required to evaluate the effectiveness of AMMM measures or to identify if resources are responding as predicted to impacts from each NY Bight project. This monitoring would typically be developed in coordination among BOEM and agencies with jurisdiction over the resource to be monitored. The information generated by monitoring may be used to (1) alter how an AMMM measure identified in the ROD is being implemented, (2) revise or develop new mitigation or monitoring measures for which compliance would be required under the COPs for the six NY Bight lease areas in accordance with 30 CFR 285.633(b)(2), (3) develop measures for future projects, or (4) contribute to regional efforts for better understanding of the impacts and benefits resulting from offshore wind energy projects in the Atlantic (e.g., potential cumulative impact assessment tool).

Table G-1. Proposed Action AMMM Measures

Measure ID[1]	Measure Name	Description	Resource Area Mitigated	Anticipated Enforcing Agency	Previously Applied as a COP Term and Condition
AQ-1	Using a substitute insulator gas in the switch gears and transmission systems to the maximum extent possible	Lessees must evaluate the feasibility of using non-SF_6 switchgear and shall provide the evaluation to BOEM for review. To the maximum extent feasible, Lessees should use a substitute insulator gas rather than SF_6 in the switchgear and transmission systems. If the Lessee determines using non-SF_6 switchgear is infeasible then the Lessee will provide written justification of this determination to BOEM. Any instances where the Lessee believes there is technical (and/or economic) infeasibility must be supported by a technical feasibility analysis, as appropriate, for review and concurrence by BOEM and BSEE. If non-SF_6 switchgear is determined to be technically infeasible, BOEM may consider requirements for SF_6 monitoring and leak detection.	Air Quality and GHG Emissions	BOEM and BSEE	
AQ-2	Cleaner fuels for vessels, equipment, and vehicles engaged in activities on the OCS	Lessees are encouraged to replace diesel fuel and marine fuel oil with alternative fuels such as natural gas, propane, or hydrogen, to the extent that use of such alternative fuels is feasible and provides emissions reductions. The Lessee will evaluate the feasibility of this mitigation measure and will provide the evaluation to BOEM for review. Any instances where the Lessee believes there is technical (and/or economic) infeasibility must be supported by a technical feasibility analysis, as appropriate, for review and concurrence by BOEM and BSEE.	Air Quality and GHG Emissions	BOEM and BSEE	
AQ-3	Electrification of vessels, equipment, and vehicles engaged in activities on the OCS	Lessees are encouraged to replace combustion engines with zero-emissions technology (fuel cell-electric or battery-electric) if feasible. The Lessee will evaluate the feasibility of this mitigation measure and will provide the evaluation to BOEM for review. Any instances where the Lessee believes there is technical (and/or economic) infeasibility must be supported by a technical feasibility analysis, as appropriate, for review and concurrence by BOEM and BSEE.	Air Quality and GHG Emissions	BOEM and BSEE	
AQ-4	Exhaust aftertreatment for vessels engaged in activities on the OCS	Lessees should evaluate, on a vessel-specific basis, the use of exhaust aftertreatments such as emission control technologies, for example, scrubbers for SO_2 and selective catalytic reduction for NO_X. The Lessee will evaluate the feasibility of this mitigation measure and will provide the evaluation to BOEM for review. Any instances where the Lessee believes there is technical (and/or economic) infeasibility must be supported by a technical feasibility analysis, as appropriate, for review and concurrence by BOEM and BSEE.	Air Quality and GHG Emissions	BOEM and BSEE	
AQ-5	Exhaust aftertreatment for older engines in vehicles and equipment engaged in activities on the OCS	Lessees are encouraged to use diesel particulate filters and diesel oxidation catalysts to retrofit older (USEPA Tiers 1–3) diesel engines if feasible. The Lessee will evaluate the feasibility of this mitigation measure and will provide the evaluation to BOEM for review. Any instances where the Lessee believes there is technical (and/or economic) infeasibility must be supported by a technical feasibility analysis, as appropriate, for review and concurrence by BOEM and BSEE.	Air Quality and GHG Emissions	BOEM and BSEE	
AQ-6	Onshore measures: zero-emissions technologies	Lessees are encouraged to require their contractors to use ports equipped with shore power and zero-emissions material-handling equipment, and construction firms that offer alternative-fueled or zero-emissions equipment and vehicles. The Lessee may evaluate the feasibility of this mitigation measure and provide the evaluation to BOEM for review.	Air Quality and GHG Emissions	Voluntary/Outside of BOEM jurisdiction	
AQ-7	Onshore measures: diesel engine emissions standards	Lessees are encouraged to require their contractors to ensure that all diesel engines in vehicles and equipment meet USEPA Tier 4 emissions standards. The Lessee may evaluate the feasibility of this mitigation measure and provide the evaluation to BOEM for review.	Air Quality and GHG Emissions	Voluntary/Outside of BOEM jurisdiction	
BB-1	Immediate reporting of injured/dead ESA-listed bird and bats	Any occurrence of dead or injured ESA-listed birds or bats must be reported to BOEM, BSEE, and USFWS as soon as practicable (taking into account crew and vessel safety), ideally within 24 hours and no more than 72 hours after the sighting. If practicable, the Lessees must carefully collect the dead specimen and preserve the material in the best possible state, contingent on the acquisition of any necessary wildlife permits and compliance with the Lessees' health and safety standards.	Bats, Birds	BOEM, BSEE, and USFWS	✓
BB-2	Injured/dead bird and bat reporting	Lessees must submit an annual report covering each calendar year, due by January 31, documenting any dead or injured birds or bats found on vessels and structures during construction, operations, and decommissioning in the preceding year. The report must be submitted to BOEM, BSEE, and USFWS. The report must contain the following information: the name of species, date found, location, a picture to confirm species' identity (if possible), and any other relevant information. Carcasses with federal or research bands must be reported to the United States Geological Survey Bird Band Laboratory.	Bats, Birds	BOEM, BSEE, and USFWS	✓
BB-3	Bird and bat monitoring	**Bird and Bat Post-Construction Monitoring Plan.** The Lessees must develop and implement a Bird and Bat Post-Construction Monitoring Plan (BBPCMP) based on the Lessees' Bird and Bat Post-Construction Monitoring Framework (BB-4), in coordination with BSEE, USFWS, and appropriate state agencies. Annual monitoring reports will be used to determine the need for adjustments to monitoring approaches, consideration of new monitoring technologies, and/or additional periods of monitoring. Prior to, or concurrent with, offshore construction activities, the Lessees must submit a BBPCMP for BOEM, BSEE and USFWS review. BOEM, BSEE, and USFWS will review the BBPCMP and provide any comments on the plan within 60 days of its submittal. The Lessees must resolve all comments on the BBPCMP to the satisfaction of BOEM and BSEE, before implementing the plan and prior to the commissioning of WTG operations. The goals of the BBPCMP will be: (1) to advance understanding of how the target species utilize the offshore airspace and	Bats, Birds	BOEM, BSEE, and USFWS	✓

Measure ID[1]	Measure Name	Description	Resource Area Mitigated	Anticipated Enforcing Agency	Previously Applied as a COP Term and Condition
		do (or do not) interact with the wind farm; (2) to improve the collision estimates from the Stochastic Collision Risk Assessment for Movement (SCRAM) (or its successor) for listed bird species; and (3) to inform any efforts aimed at minimizing collisions or other project effects on target species. **Monitoring.** The Lessees must conduct monitoring as outlined in the Bird and Bat Post-Construction Monitoring Plan, which shall include use of radio-tags to monitor movement of ESA-listed birds in the vicinity of the project. The BBPCMP will allow for changing methods over time in order to regularly update and refine collision estimates for listed birds. Specific to this purpose, the plan shall include an initial monitoring phase involving deployment of Motus radio tags on listed birds in conjunction with installation and operation of Motus receiving stations on WTGs in the Lease Area following offshore Motus recommendations (https://motus.org/groups/atlantic-offshore-wind/). The initial phase may also include deployment of satellite-based tracking technologies (e.g., Global Positioning System [GPS] or Argos tags). The monitoring shall also include digital aerial surveys to monitor avoidance behavior and densities. **Annual Monitoring Reports.** The Lessees must submit to BOEM (at renewable_reporting@boem.gov), USFWS, and BSEE (via TIMSWeb and at protectedspecies@bsee.gov) a comprehensive report after each full year of monitoring (pre- and post-construction) within12 months. The report must include all data, analyses, and summaries regarding ESA-listed and non-ESA-listed birds and bats. BOEM, BSEE, and the USFWS shall use the annual monitoring reports to assess the need for reasonable revisions (based on subject matter expert analysis) to the BBPCMP. BOEM and BSEE reserve the right to require reasonable revisions to the BBPCMP and may require the use of new technologies as they become available for use in offshore environments. **Post-Construction Quarterly Progress Reports**. The Lessees must submit quarterly progress reports during the implementation of the BBPCMP to BOEM (at renewable_reporting@boem.gov), BSEE, and USFWS by the 15th day of the month following the end of each quarter during the first full year that the project is operational. The progress reports must include a summary of all work performed, an explanation of overall progress, and any technical problems encountered. **Monitoring Plan Revisions.** Within 30 days of submitting the annual monitoring report, the Lessees must meet with BOEM, BSEE, USFWS, and appropriate state agencies to discuss the following: the monitoring results; the potential need for revisions to the BBPCMP, including technical refinements or additional monitoring; and the potential need for any additional efforts to reduce impacts. If, based on this annual review meeting, BOEM, in consultation with USFWS, determines that revisions to the BBPCMP are necessary, BOEM will require the Lessees to modify the BBPCMP. If the projected collision levels, as informed by monitoring results, deviate substantially from the effects analysis, the Lessees must transmit recommendations for new mitigation measures and/or monitoring methods to BOEM. The frequency, duration, and methods for various monitoring efforts in future revisions of the BBPCMP will be determined adaptively based on current technology and the evolving weight of evidence regarding the likely levels of collision mortality for each listed bird species. The effectiveness and cost of various technologies/methods will be key considerations when revising the plan. Grounds for revising the BBPCMP include, but are not limited to: (i) greater than expected levels of collision of listed birds; (ii) evolving data input needs for SCRAM (or its successor); (iii) changing technologies for tracking or otherwise monitoring listed birds in the offshore environment that are relevant to assessing collision risk; (iv) new information or understanding of how listed birds utilize the offshore environment and/or interact with wind farms; and (v) coordination and alignment of tracking, monitoring, and other data collection efforts for listed birds across multiple wind farms/leases on the OCS. The Lessees shall continue implementation of appropriate monitoring activities for listed birds (under the current and future versions of the BBPCMP) until one of the following occurs: (i) the WTGs cease operation; (ii) USFWS concurs that a robust weight of evidence has demonstrated that collision risks to all listed birds from WTG operations are negligible (i.e., the risk of take from WTG operation is discountable); or (iii) USFWS concurs that further data collection is unlikely to improve the accuracy or robustness of collision mortality estimates and is unlikely to improve the ability of BOEM and the Lessee to reduce or offset collision mortality. **Operational Reporting (Operations)**. The Lessees must submit to BOEM (at renewable_reporting@boem.gov) and BSEE (via TIMSWeb and at protectedspecies@bsee.gov) an annual report summarizing monthly operational data calculated from 10-minute supervisory control and data acquisition data for all WTGs together in tabular format: the proportion of time the WTGs were operational (spinning at >x revolutions per minute [rpm]) each month, the average rotor speed (rpm) of spinning WTGs plus 1 standard deviation, and the average pitch angle of blades (degrees relative to rotor plane) plus 1 standard deviation. Any operational data considered by the Lessee to be privileged or confidential must be clearly marked as confidential business information and will be handled by BOEM and BSEE in a manner consistent with 30 CFR 585.114. **Raw Data.** The Lessees must store the raw data from all avian and bat surveys and monitoring activities according to accepted archiving practices. Such data must remain accessible to BOEM, BSEE and USFWS upon request for the duration of the lease. The Lessees must			

Measure ID[1]	Measure Name	Description	Resource Area Mitigated	Anticipated Enforcing Agency	Previously Applied as a COP Term and Condition
		work with BOEM to ensure the data are publicly available. All avian tracking data (i.e., from radio and satellite transmitters) must be stored, managed, and made available to BOEM, BSEE, and USFWS following the protocols and procedures outlined in the agency document entitled *Guidance for Coordination of Data from Avian Tracking Studies*, or its successor applicable at the time the particular data is being stored. All bat data must be stored in NBat.			
BB-4	Bird and bat monitoring plan framework	Lessees must develop a framework for a Bird and Bat Post-Construction Monitoring Plan (BB-3) in coordination with BOEM and USFWS. Lessees are encouraged to include this framework with their initial COP submission or subsequent updated versions.	Bats, Birds	BOEM and USFWS	
BEN-1	Boulder avoidance, identification, and relocation	Lessees must avoid boulders within the lease area and along the export cable corridor; if avoidance is not possible, Lessees must minimize the boulder relocation distance. If the Lessee needs to relocate boulders, they must submit a Boulder Identification and Relocation Plan. The plan must detail, to the extent technically and/or economically practical or feasible for the project, how the Lessee will relocate boulders as close as practicable to areas immediately adjacent to existing similar habitat. The plan must be submitted to BOEM and BSEE to coordinate with NMFS for a 60-day review, 120 days prior to boulder relocation activities. The Lessee must resolve all comments on the Boulder Relocation Plan to BOEM and BSEE's satisfaction prior to implementation of the plan. If BOEM or BSEE do not provide comments on the plan within 60 days of its submittal, then the Lessee may presume concurrence with the plan. The plan must include sufficient scope to mitigate boulders for facility installation and operation risks.	Benthic; Finfish, Invertebrates, and EFH	BOEM, BSEE, and NMFS	✓
BEN-2	Foundation scour protection monitoring	The Lessee must inspect scour protection performance. The Lessee must submit an Inspection Plan to BSEE at least 60 days prior to initiating inspection activities described in the Inspection Plan. BSEE will review the Inspection Plan and provide comments, if any, on the plan within 60 days of its submittal. The Lessee must resolve all comments on the Inspection Plan to BSEE's satisfaction and receive BSEE's concurrence prior to initiating the inspection program. If BSEE does not send comments within 60 days, the Lessee may presume concurrence. • The Lessee must carry out an initial foundation scour inspection of each foundation within 6 months of completing installation of that foundation, thereafter at intervals not greater than 5 years, and within 180 days after a storm event (as defined by the post-storm event monitoring plan, described in MUL-16). • The Lessee must provide BSEE with a foundation scour monitoring report within 90 days of completing each foundation scour inspection. If multiple foundation locations are inspected within a single survey effort, the foundation scour monitoring reports for those locations may be combined into a single foundation scour monitoring report to be provided within 90 days of completing the last foundation scour inspection within this single survey effort. The schedule of reporting must be included in the Inspection Plan and concurred in by BSEE. • If scour protection losses develop within 10% of the maximum loss allowance, edge scour develops within 10% of the maximum allowance, or if spud depressions from installation affect scour protection stability, the Lessee must submit a plan for additional monitoring and/or mitigation to BSEE for review and concurrence.	Benthic; Finfish, Invertebrates, and EFH	BOEM, BSEE, and NMFS	✓
BIR-1	Bird-Deterrent Devices and Plan	To minimize attracting birds to operating WTGs, the Lessees must install bird perching-deterrent device(s) on each WTG and OSS. The Lessees must submit a plan to deter perching on offshore infrastructure by roseate terns and other marine birds for BOEM and BSEE to review in coordination with USFWS and with the FIR ("Bird Perching Deterrent Plan"). BOEM and BSEE will review the Bird Perching Deterrent Plan and provide any comments on the plan within 60 days of its submittal. The Lessees must resolve all comments on the Bird Perching Deterrent Plan to the satisfaction of BOEM and BSEE before implementing the plan The Bird Perching Deterrent Plan must include the type(s) and locations of bird perching-deterrent devices and a monitoring plan for the life of the project, must allow for modifications and updates as new information and technology becomes available, and must track the efficacy of the deterrents. The plan must be based on best available science regarding the effectiveness of perching-deterrent devices on minimizing collision risk. The location of bird perching-deterrent devices must be proposed by the Lessees based on best management practices applicable to the appropriate operation and safe installation of the devices. The Lessees must also provide the location and type of bird-deterrent devices as part of the as-built submittals to BSEE.	Birds	BOEM, BSEE, and USFWS	✓
BIR-2	Light impact reduction for birds	Nothing in this condition supersedes or is intended to conflict with lighting, marking, and signaling requirements of FAA, USCG, or BOEM. The Lessee must use lighting technology that minimizes impacts on avian species to the extent practicable including lighting designed to minimize upward illumination. The Lessee must provide USFWS with a courtesy copy of the final Lighting, Marking, and Signaling Plan, and the Lessee's approved application to USCG to establish Private Aids to Navigation (PATON).	Birds	FAA, USCG, BOEM, and BSEE	
BIR-3	Compensatory Mitigation Plan for	At least 180 days prior to the start of commissioning of the first WTG, the Lessee must distribute a Compensatory Mitigation Plan to BOEM, BSEE, and USFWS for review and comment. BOEM, BSEE, and USFWS will review the Compensatory Mitigation Plan and provide	Birds	BOEM, BSEE, and USFWS	✓

Measure ID[1]	Measure Name	Description	Resource Area Mitigated	Anticipated Enforcing Agency	Previously Applied as a COP Term and Condition
	Piping Plover and Red Knot	any comments on the plan to the Lessee within 60 days of its submittal. The Lessee must resolve all comments on the Compensatory Mitigation Plan to BOEM and BSEE's satisfaction before implementing the plan and before commissioning of the first WTG. The Compensatory Mitigation Plan must provide compensatory mitigation actions to offset take of piping plover and red knot by the fifth year of WTG operation. The Compensatory Mitigation Plan must include: (a) detailed description of the mitigation actions including mitigation mechanisms (e.g., mitigation agreement, applicant-proposed mitigation), (b) the specific location for each mitigation action, (c) a timeline for completion of the mitigation measures, (d) itemized costs for implementing the mitigation actions, and (e) monitoring to ensure the effectiveness of the mitigation actions in offsetting take.			
COMFIS-1	Compensation for gear loss and damage	The Lessee should implement a gear loss and damage compensation program. The Lessee should consult BOEM's draft guidance for Mitigating Impacts to Commercial and Recreational Fisheries on the Outer Continental Shelf Pursuant to 30 CFR 585 or as modified in response to public comment in the development of the program. For example, the Lessee should consider compensation for damaged gear resulting from interactions between the fishing industry and non-marked/non-charted or marked/charted property (e.g., concrete mattresses) of the Lessee.	Commercial and For-Hire Fishing	BOEM and BSEE	
COMFIS-2	Scour and cable protection	In areas where scour and/or cable protection measures are required, the Lessee must ensure that all materials used for these measures reflect the pre-existing conditions at the site, as technically or economically feasible. To avoid new hangs for mobile fishing gear in areas that are regularly trawled, cable protection measures must have tapered or sloped edges. In areas that are not regularly trawled, natural or engineered stone or concrete may be employed. These materials should provide three-dimensional complexity in height and in interstitial spaces, as technically or economically feasible. All materials should not inhibit epibenthic growth. The Lessee must prepare a Scour and Cable Protection Plan (SCPP) that includes descriptions and specifications for all cable protection materials. The Lessee must submit the SCPP to BOEM, BSEE, and NOAA. The Lessee must resolve all comments on the SCPP to BOEM and BSEE's satisfaction before placement of cable protection measures.	Commercial and For-Hire Fishing	BOEM and BSEE	✓
COMFIS-3	Scallop Monitoring Plan	The Lessee should coordinate with NMFS and potentially impacted scallop fishermen to develop a Scallop Monitoring Plan. The plan should discuss potential impacts from construction, including turbidity, problems due to scour protection, cooling of waters, changed currents, etc., and methods to avoid or reduce those impacts. Lessees should monitor potential impacts on scallop populations and use consistent methodologies for standard and robust data collection. Data should be compatible with other collected information for regional data integration and analyses. If the monitoring results deviate substantially from the anticipated impacts, the Lessees are encouraged to propose new mitigation measures and/or monitoring methods to BOEM and BSEE for review and concurrence.	Commercial and For-Hire Fishing	BOEM, BSEE, and NMFS	
COMFIS-4	Fisheries mitigation	**Static cable design elements** are recommended: 1. All static cables should be buried to a minimum depth of 3 feet below stable seabed where technically feasible. Technical feasibility constraints include seabed conditions that preclude burial, such as telecommunication cable crossings. Deeper cable burial depths may be required dependent on risks identified in cable route design (see the Carbon Trust's Cable Burial Risk Assessment Methodology at: https://ctprodstorageaccountp.blob.core.windows.net/prod-drupal-files/documents/resource/public/cable-burial-risk-assessment-guidance.pdf). 2. Lessees should avoid installation techniques that raise the profile of the seabed, such as the ejection of large, previously buried rocks or boulders onto the surface. The ejection of this material may damage fishing gear. If raising the profile of the seabed is unavoidable, the Lessees should propose measures in the COP to minimize the total area of impact through measures such as removing potential obstructions from areas where bottom-tending fishing gear is actively used or consolidating such obstructions in areas where bottom-tending fishing gear is not actively used. 3. If needed, cable protection measures should reflect the pre-existing conditions at the site. This mitigation measure ensures that seafloor cable protection does not introduce new obstructions for mobile fishing gear. Thus, the cable protection measures should be trawl-friendly with tapered or sloped edges. If cable protection is necessary in "non-trawlable" habitat, such as rocky habitat, then the Lessees should use materials that mirror the benthic environment. 4. Where technically and economically feasible, cables should share corridors and minimize the total area disturbed. **Project design** should be planned in coordination with fisheries: 1. The facility design should seek to maximize existing access to fisheries in balance with other siting constraints by considering: a. Transit within the project area and traditional fishing activities within the project area. b. Consolidation of infrastructure, where practicable, to reduce space-use conflicts. c. Technologies to reduce total project area and meet energy production commitments.	Commercial and For-Hire Fishing	Voluntary	

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		2. Turbine locations should be sited to avoid areas of commercial fishery production such as known sensitive benthic features and natural and artificial reefs. 3. Facility planning should use nature-inclusive designs (see Evaluating the Effectiveness of Nature Inclusive Design Materials at: https://www.boem.gov/sites/default/files/documents/environment/environmental-studies/SDP_2022-2023.pdf), where applicable, to maximize available habitat for fish. 4. Installation techniques and time windows should minimize disruption to fishing activities (e.g., simultaneous lay and burial, or conducting activity during the appropriate time of year). To improve **safety** at sea in and around offshore wind facilities, BOEM recommends that Lessees consider the following measures in their plan submittals: 1. Charting all facilities and obstructions resulting from construction and operations of an offshore wind energy facility and providing that information to NOAA, USCG, and navigational software companies. 2. Employing liaisons with experience in the commercial fishing industry to provide safety and communication services during construction. 3. Monitoring cable burial in real-time and reporting all potential hazard events to USCG as soon as possible throughout the life of the project. 4. Using digital information technology platforms (e.g., smartphone applications) to bring together survey and construction schedules and locations in addition to standard local notices to mariners via the USCG. 5. Marking facilities and appurtenances with permanent identification of the project and company. 6. Providing training opportunities for the commercial fishing industry to simulate safe navigation through a wind facility in various weather conditions and at various speeds. 7. Monitoring safety threats (e.g., radar disruption, ice shedding, vessel allisions and collisions, security threats, unexploded ordnance/munitions of explosive concern, and impacts on search and rescue efforts) throughout the life of a project. 8. Consulting with the fishing industry and USCG to identify which structures would be most appropriate for Automatic Identification System (AIS) transponders consistent with BOEM's Lighting and Marking Guidelines (https://www.boem.gov/2021-lighting-and-marking-guidelines). 9. Considering Lessee-funded radar system upgrades for commercial and for-hire recreational fishing vessels (e.g., solid state Doppler-based marine vessel radar systems; see National Academies of Science Engineering and Medicine 2022).[1]			
COMFIS-5	Fisheries Survey Guidelines	Lessees should follow the BOEM Fisheries Survey Guidelines (Fisheries Guidelines, updated March 27, 2023, at: https://www.boem.gov/sites/default/files/documents/about-boem/Fishery-Survey-Guidelines.pdf) with regards to pre-, during- and post-construction fisheries monitoring survey plan design.	Commercial and For-Hire Fishing, Marine Mammals	Voluntary	
COMFIS-6	Fisheries compensatory mitigation	The Lessees must establish a compensation/mitigation fund (Fund) to compensate commercial and for-hire recreational fishermen for loss of income due to unrecovered economic activity resulting from displacement from fishing grounds due to project construction and operations. The Fund should also allow for compensation to shoreside businesses for losses indirectly related to project development. The Lessee may use BOEM's draft Guidance for Mitigating Impacts to Commercial and Recreational Fisheries on the Outer Continental Shelf Pursuant to 30 CFR 585 (Guidance) to aid it in establishing such a Fund. For losses to commercial and for-hire recreational fishermen, the Fund must be based on the revenue exposure for fisheries. For losses to shoreside businesses, the Lessee will analyze the impacts on shoreside seafood businesses. Shoreside businesses that may be impacted may include (but are not limited to): fishing gear suppliers and repair services, vessel fuel and maintenance services, ice and bait suppliers, seafood processors and dealers, and wholesale seafood distributors. The Lessee will be required to provide BOEM with its analysis (including any model outputs, such as an IMPLAN model or other economic report) verifying the impacts on shoreside businesses and services. The Lessee must submit to BOEM a report that includes (1) a description of the structure of the Fund and (2) an analysis of the impacts of the expected development on shoreside businesses, for a 45-day review and comment period at least 90 days prior to establishment of the Fund. The Lessee must resolve all comments on the report to BOEM's satisfaction before implementation of the Fund. The Lessee must then submit to BOEM evidence of the implementation of the Fund, including:	Commercial and For-Hire Fishing	BOEM, BSEE, NJDEP, and NYDEP	

[1] National Academies of Science Engineering and Medicine. 2022. Wind Turbine Generator Impacts to Marine Vessel Radar. Washington, D.C.: The National Academies Press. https://doi.org/10.17226/26430.

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		• A description of any implementation details not covered in the report to BOEM regarding the mechanism established to compensate for losses to commercial and for-hire recreational fishermen and shoreside businesses resulting from all phases of the project development on the lease area (pre-construction, construction, operation, and decommissioning); • The Fund charter, including the governance structure, audit and public reporting procedures, and standards for paying compensatory mitigation for impacts on fishers and related shoreside businesses from lease area development; and • Documentation regarding the funding account, including the dollar amount, establishment date, financial institution, and owner of the account.			
CUL-2	Marine cultural resources avoidance or additional investigation	BOEM will establish and Lessees must comply with requirements for all protective buffers recommended by BOEM for each marine cultural resource (i.e., archaeological resource and ASLFs) based on the size and dimension of the resource. Protective buffers must extend outward from the maximum discernable limit of each resource and are intended to minimize the risk of disturbance during construction. If an adverse effect cannot be avoided, the Lessee will be required to conduct further investigations to minimize or resolve effects on these historic properties.	Cultural Resources	BOEM or BSEE	✓
CUL-3	Ancient submerged landform feature (ASLF) monitoring program and marine archaeological post-review discovery plan	BOEM will establish and the Lessees must comply with monitoring and post-review discovery plans outlining processes to document and review impacts of construction or any seabed-disturbing activities on marine cultural resources. Such plans may be submitted to BOEM with the Marine Archaeological Resources Assessment appendix to the COP, or may be developed in the course of BOEM's project-level NEPA review and Section 106 consultation on marine archaeological resources. A post-review discovery plan approved by BOEM is also required in the event that an unanticipated discovery and/or inadvertent impact of a marine archaeological resource occurs.	Cultural Resources	BOEM or BSEE	✓
CUL-4	Terrestrial archaeological resource avoidance or additional investigation	BOEM will establish avoidance criteria for any identified terrestrial archaeological historic property or any unevaluated terrestrial archaeological resource. Lessees must avoid impacts on identified terrestrial archaeological historic properties or unevaluated resources. If avoidance is not feasible, the Lessee must develop a plan to be submitted to BOEM that addresses the adverse effect on the terrestrial archaeological resource. The Lessee may submit this plan with the Terrestrial Archaeological Resources Assessment appendix to the COP, or may develop this plan in the course of BOEM's project-level NEPA review and Section 106 consultation on terrestrial archaeological resources. Avoidance would entail the development and implementation of avoidance buffers around each historic property and unevaluated resource. If avoidance of an unevaluated resource is not feasible, additional investigations must be conducted for the purpose of determining eligibility for listing in the NRHP.	Cultural Resources	BOEM, BSEE, or other agencies that have statutory enforcement authority over cultural resources	✓
CUL-5	Terrestrial archaeological resource monitoring program and terrestrial archaeological post-review discovery plan	BOEM will establish and the Lessees must comply with monitoring and post-review discovery plans outlining processes to document and review impacts of construction or any ground-disturbing activities on terrestrial archaeological resources. A monitoring plan may be submitted to BOEM with the Terrestrial Archaeological Resources Assessment appendix to the COP, or may be developed in the course of BOEM's project-level NEPA review and Section 106 consultation on terrestrial archaeological resources. A monitoring plan may be required for certain areas, identified through consultation, to ensure impacts on resources are avoided or minimized. A post-review discovery plan would be required regardless of impacts for the purposes of establishing a protocol in the event of an unanticipated discovery and/or inadvertent impact on a terrestrial archaeological resource.	Cultural Resources	BOEM, BSEE, or other agencies that have statutory enforcement authority over cultural resources	✓
CUL-6	Historic Properties Treatment Plans (HPTPs)	BOEM, with the assistance of the Lessees, must develop and implement one or more Historic Property Treatment Plans (HPTPs) to address adverse effects on historic properties that cannot be avoided. Draft HPTPs may be submitted to BOEM with the Historic Resources Visual Effects Analysis, Terrestrial Archaeological Resources Assessment, or Marine Archaeological Resources Assessment appendices to the COP, or may be developed in the course of BOEM's project-level NEPA review and Section 106 consultation. The HPTP(s) will be developed in consultation with property owners and consulting parties who have demonstrated interest in specific historic properties. The HPTP(s) will provide details and specifications for mitigation measures to resolve adverse effects, including cumulative visual effects on aboveground historic properties.	Cultural Resources	Mitigation may be required by Section 106 of the NHPA consultation	✓
CUL-7	Section 106 mitigation fund	Through consultation, BOEM may request that the Lessees financially contribute to a third-party managed compensatory mitigation fund to address impacts on historic properties related to OCS offshore wind activities.	Cultural Resources	Mitigation may be required by Section 106 of the NHPA consultation	✓
EJ-1	Environmental Justice Communications Plan	The Lessee must submit a draft Environmental Justice Communications Plan (EJ Communications Plan) for communicating with Environmental Justice (EJ) communities or populations (defined for all mitigations as "communities with environmental justice concerns" or underserved communities as related to the intent of Executive Orders 12898 and 14096, referred to herein as "EJ populations") as a part of its initial COP submission or in subsequent updated versions. The EJ Communications Plan must document	Environmental Justice, Land Use and Coastal Infrastructure	BOEM, BSEE, and USACE	

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		the process of how the Lessee plans to communicate during activities described in the COP, including construction, operations, and decommissioning. Because potential impacts on EJ populations are expected to be much lower during operations than during construction or decommissioning, the EJ Communications Plan should reflect different levels of communications needed, as appropriate, during these different stages. The Lessee may utilize efforts or language developed for any state requirements to satisfy this EJ Communication Plan partially or wholly. The EJ Communications Plan must specifically target low-income and minority populations, and communities identified by applicable state-level EJ and related screening tools, and advance meaningful engagement based on each affected community's unique communication and information needs. The plan must be finalized prior to COP decision. In the EJ Communications Plan, the Lessee must: • Describe which EJ populations may be potentially affected by COP activities, with sufficient detail about which activities could impact which areas or populations and at what times. In identifying EJ populations, Lessees should use both federal and state-level screening tools with an intent to be as inclusive as possible and meet the most recent guidance and best practices. At minimum, the following screening tools should be used, as applicable to the project location: Environmental Protection Agency's EJScreen, New York Department of Environmental Conservation Potential Environmental Justice Areas, New York State Disadvantaged Communities Mapping Tool, and New Jersey Department of Environmental Protection EJMAP tool. Lessees should review additional data sources and tools for potential incorporation and must document the sources and methods for identifying EJ populations included in the EJ Communications Plan. • Describe how each potentially affected EJ population desires to be communicated with during activities described in the COP (e.g., communication methods, language needs). • Describe how coordination with other Lessees in the region will occur in advance of communication with EJ populations, especially in cases where onshore activities described in the COP may be in proximity to other projects. The intent of coordination is to reduce engagement redundancy and burden on EJ populations. • Describe how Lessees will communicate when and where activities described in the COP will take place, who they may affect, and how they may affect EJ populations. • Describe how Lessees will respond to any concerns or questions from EJ populations during activities described in the COP, and the process Lessees will undertake to communicate with EJ populations to ensure these concerns or questions are addressed. Include how the Lessee will handle any questions or concerns that are not related to that Lessee's activities or applicable to regional offshore wind activities. • Describe when, how, and to whom employment opportunities are advertised and how the Lessee plans to maximize access to those opportunities for low-income and minority populations, including but not limited to the communication and advertising for training programs and hiring processes. • Describe how the Lessee will communicate investment or supply chain opportunities to meet any Lessee commitments to diversity or equal access, including but not limited to those included in NY Bight lease stipulation 7.1. • Describe any related requirements or ongoing efforts in coordination with the states of New York and New Jersey. Include a summary of feedback received from EJ populations on the above bullets (see EJ-3).			
EJ-2	Environmental Justice Mitigation Resources Plan	Lessees must submit, along with the draft EJ Communications Plan (EJ-1) as part of their initial COP submission or in subsequent updated versions, a draft Environmental Justice Community Mitigation Resources Plan (EJ Mitigation Resources Plan) for providing households in EJ populations that are impacted by activities described in the COP (affected households) with any supplies or mitigation resources needed (e.g., air filters, noise canceling headphones, blackout curtains) to reduce adverse impacts. The EJ Mitigation Resources Plan must provide sufficient detail on how eligibility for mitigation resources will be determined, including duration for which resources will be provided, based on anticipated activities and localized impacts, including examples. The plan must also outline roles and responsibilities of households and Lessees, and there should be clear guidelines around principles of equity, transparency, and fairness. The plan must be finalized prior to COP decision.	Environmental Justice	BOEM, BSEE, and USACE	
EJ-3	Reporting and feedback requirements for (1) EJ Communications Plan and (2) EJ Mitigation Resources Plan	Lessees must submit updates on progress toward developing an EJ Communications Plan and an EJ Mitigation Resources Plan every 6 months through the Progress Report as required in NY Bight lease stipulation 3.1 of Addendum C. Lessees must incorporate EJ community feedback into their EJ Communications Plan and EJ Mitigation Resources Plan. BOEM's Environmental Justice Forum associated with the NY Bight PEIS may be one opportunity to coordinate with EJ populations and organizations that serve them, but BOEM expects additional coordination would be needed specifically targeting f potentially affected EJ populations. Lessees should look to state requirements and best practices on locally appropriate engagement. BOEM may provide	Environmental Justice	BOEM, BSEE, and USACE	

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		feedback on the two plans for Lessee consideration but will consider these plans compliant upon receipt if they have provided all applicable descriptions and demonstrate that meaningful engagement occurred, including sharing the plans with EJ populations for feedback. Under the annual certification of compliance per 30 CFR 285.633, "How do I comply with my COP?" Lessees shall provide a summary of any EJ Communications Plan or EJ Mitigation Resource Plan activities that occurred. This should describe all actions taken that year under the EJ Communications Plan and summarize the number and type of mitigation resources distributed, and to which EJ populations they were distributed. Implementation of the EJ Communications Plan and EJ Mitigation Resources Plan in potentially affected EJ populations during construction and operations shall be audited through BSEE's Safety Management System (SMS). Through the SMS, Lessees are expected to adaptively address communications and mitigation resource needs over the life of the project. Lessees are expected to respond to any recommendations made by EJ populations or BSEE during the audit process in order to improve the plans over time. All changes must be initially discussed with BSEE through the SMS process. Any changes to the EJ Communications Plan or EJ Mitigation Resources Plan, jointly agreed upon by Lessees and BSEE during the SMS process, must be documented in the summary in the annual certification of compliance with an explanation for why the change was needed, a description of expected outcomes, and documentation of meaningful engagement with potentially affected EJ populations related to the change. All written deliverables may be made publicly accessible on BOEM or BSEE's website; they must be submitted in a ready to publish format that also meets requirements of Section 508 of the Rehabilitation Act (29 U.S.C. 794d), as amended.			
EJ-4	EJ compensatory mitigation	Lessees will financially contribute annually an amount (not to exceed 1% of revenue calculated per MWh) for the duration of electricity production to a third-party managed compensatory mitigation fund to address disproportionate and adverse impacts on EJ populations directly tied to OCS offshore wind activities, as related to the impact analysis discussed in the COP-specific NEPA review, that has not been addressed through another mitigation measure. Fund contributions will be based on analysis of residual disproportionate and adverse impacts in the COP-specific NEPA review. Lessees will contribute to the fund upon selection of this measure as a condition of approval of the COP. A Board of Trustees with representatives from impacted communities, community-based organizations, state representatives, Tribal Nations, and offshore wind Lessees will be set up to make decisions and liaise with the third-party fund managers. A multi-party group with representatives from each aforementioned category will be convened in coordination with third-party fund managers to develop a Charter that specifies roles, responsibilities, and the selection process for the Board of Trustees. The amount of the contribution(s) will be calculated based on residual impacts, and flexible under the 1% threshold, and may be adjusted as needed based on the level of impacts occurring, which will vary over the life of the project. Specific criteria of fund management and fairness (e.g., fiduciary controls, minimization of administrative expenses, representation of underserved communities on the board of trustees) will be set to ensure proper management of the fund and selection criteria for recipients of funds. Managed funds would be distributed by the third-party manager as grant(s) to households, businesses, community-based organizations, or other appropriate recipient that demonstrate they (1) meet the definition of being part of an EJ population or community with environmental justice concerns (as defined under Executive Orders 12898 or 14096) or potential EJ areas identified by New York Department of Environmental Conservation or New Jersey's Environmental Justice Law (New Jersey Statutes Annotated 13:1D-157) definition of overburdened communities and (2) have been disproportionately and adversely impacted by OCS offshore wind activities. Any monetary distributions from the fund shall accomplish at least one of the following objectives: (1) improve household or community-level responses or ability to adjust to disproportionate and adverse impacts, including lost wages or job loss; (2) protect or improve community-wide access to coastal recreation and greenspace areas or enjoyment of coastal viewsheds to offset any changes directly caused by OCS offshore wind activities; or (3) enhance community welfare to offset disproportionate and adverse impacts of OCS activities on community welfare. Eligible impacts must be a direct result of OCS offshore wind activities and not otherwise mitigated. The mitigation measure applies to BOEM-authorized and -permitted activities and associated support activities, which could occur on the OCS or onshore.	Environmental Justice	BOEM and BSEE	
MM-1	Reporting of all NARW sightings	If a NARW is observed at any time by PSOs or personnel on any project vessels, during any project-related activity, or during vessel transit, the Lessee must report the sighting information immediately after conclusion of the detection event (the time, location, and number of animals, closest point of approach, activities at time of detection, vessel speed, animal behavior, who made initial detection, was the required notification issued, mitigation measures implemented) to BOEM (renewable_reporting@boem.gov), NOAA Fisheries 24-hour Stranding Hotline number (866-755-6622), USCG via channel 16, BSEE (TIMSWeb and notification email to protectedspecies@bsee.gov), and through the WhaleAlert app (http://www.whalealert.org/).	Marine Mammals	BOEM, BSEE, and NMFS	✓

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MM-2	Real-time PAM monitoring and alert system for baleen whales	Implementation of a near real-time passive acoustic monitoring (PAM) system for the detection of baleen whales in the NY Bight during offshore wind development activities will be required, with an alert system/notice to mariners/construction operators. This could be achieved through the deployment of several ocean gliders or fixed PAM systems in the broader NY Bight area. The equipment could be deployed anywhere there is offshore wind development activities, including on the leases, but may be particularly useful between leases where the placement of other real-time PAM systems is not already directed, or near transit or cable-laying corridors, or other locations where real-time alerting of marine mammal presence would be beneficial to the offshore wind-related activities occurring in one or more lease areas. Every effort should be made to deploy equipment in advance of any on-water activity, including site characterization work, construction work, etc., for use in mitigating against potential vessel strike risk. Each system will be equipped with reliable PAM technology and marine mammal detection and classification software. Detections will be transmittable to a PAM analyst for verification. The systems will be capable of alerting offshore wind developers that a baleen whale has been detected in the general area of offshore wind development-related activity, through methods such as Whale Alert or an offshore wind-specific notification system. This could also be achieved through partnership with other industries, academia, NGOs, and federal agencies in a regional effort. This real-time PAM alert system will increase the opportunity to detect marine mammals in the greater NY Bight area, providing the opportunity for increased situational awareness (for vessel strike avoidance) to PSOs and others of marine mammal presence in the area. The submission of raw data or data products associated with real-time PAM will be required. The real-time PAM data will be saved and stored for archiving as soon as practicable after instrument recovery through the National Centers for Environmental Information or a similar entity determined by BOEM. The archived data will be integrated into community PAM efforts in the broader region, such as through the Regional Wildlife Science Collaborative, to understand marine mammal distribution/occurrence in the area, which can then be used to inform future predictions of potential impacts to marine mammals.	Marine Mammals	BOEM, BSEE, and NMFS	
MM-3	Long-term PAM monitoring	The Lessee must conduct archival, continuous, and long-term PAM to develop baselines and monitor changes in the presence of marine species as well as changes in ambient noise for 1 year before construction through at least 10 years of operations. The exact number of instruments per lease area will vary but will be configured to identify and localize the calls of vocalizing NARWs within the lease area. Throughout deployments and data analysis, the Lessee will be expected to follow the best practices outlined in the Regional Wildlife Science Collaborative (RWSC) Best Practices. The Lessee must also process the data to document, at the very least, the locations of baleen whale vocalizations (with confidence intervals) and metrics of ambient noise. The Lessee will be expected to archive the full acoustic record at National Centers for Ecological Information and to submit baleen whale detections to BOEM, BSEE, and NMFS at least twice a year. As an alternative to conducting PAM in its project area, the Lessee may opt to pay into BOEM's Environmental Studies Fund on an annual basis to support long-term monitoring (equipment, deployment, data processing and archiving)—all done in a pooled approach with the RWSC—in lieu of doing it themselves. If the Lessee chooses this option, they may consult with BOEM to learn the price for their given lease area. The price and efficacy of the monitoring will be evaluated after the third year of operations is complete and is therefore subject to change. Developers would not be required to submit a Long-Term PAM Plan if they chose this option.	Marine Mammals	BOEM, BSEE, and NMFS	
MM-5	NARW Strike Management Plan	All offshore wind-related vessels will travel at 10 knots (18.5 kilometers per hour) or less while transiting to and from U.S. ports to lease areas, and while operating within lease areas, unless a NARW Strike Management Plan is submitted to BOEM, BSEE and NMFS prior to the Plan's implementation. The plan must provide details on how the required vessel and/or aerial-based surveys, and PAM, and/or other detection methodologies will be conducted to clear the vessel routes of NARW presence. The plan must also provide details on the vessel-based observer protocol on transiting vessels as well as any further efforts to minimize potential impacts. BOEM and BSEE will review the NARW Strike Management Plan and provide comments, if any, on the plan. The Lessee must resolve all comments on the NARW Strike Management Plan to BOEM and BSEE's satisfaction prior to implementing the plan.	Marine Mammals	BOEM, BSEE, and NMFS	
MMST-1	Alternative Monitoring Plan	The Lessees must submit a single Alternative Monitoring Plan containing two parts: (1) Low-Visibility Pile-Driving Monitoring and (2) Nighttime Pile-Driving Monitoring for review by NMFS, BSEE and BOEM prior to initiating foundation pile-driving activities. The purpose of this plan is to demonstrate that the Lessees can meet the visual monitoring criteria for the Level A harassment zone(s)/mitigation and monitoring zones plus an agreed-upon buffer zone (these combined zones are referred to henceforth as the nighttime and low-visibility clearance and shutdown zones). Both parts will demonstrate effective use of technologies that the Lessee is proposing to use for monitoring during nighttime and low-visibility conditions for instances during daylight hours when lighting or weather (e.g., fog, rain, sea state) prevent visual monitoring of the full extent of the clearance and shutdown zones. "Daytime" is defined as 1 hour after civil sunrise to 1.5 hours before civil sunset.	Marine Mammals, Sea Turtles	BOEM, BSEE, and NMFS	

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		The Alternative Monitoring Plan must also include measures for deploying additional observers, or using PAM with the goal of ensuring the ability to maintain all clearance and shutdown zones in the event of unexpected poor visibility conditions. BOEM and BSEE will review the Alternative Monitoring Plan and provide comments, if any, on the plan. The Lessee must resolve all comments on the Alternative Monitoring Plan to BOEM and BSEE's satisfaction prior to implementing the plan. 1. **Low-Visibility Pile-Driving Monitoring**: This part of the plan will need to identify the following components: identification of low-visibility monitoring devices (e.g., vessel-mounted thermal infrared [IR] camera systems, handheld or wearable night vision devices [NVDs], handheld IR imagers) that would be used to detect marine mammal and sea turtle species relative to the established clearance and shutdown zones. The buffer zone distance and visual monitoring criteria will be developed by NMFS and BOEM at the project stage. The Low-Visibility Pile-Driving Monitoring part will be applicable during pile-driving activities conducted in poor or low-visibility conditions (i.e., instances where clearance and shutdown zones cannot be effectively monitored), hereafter termed low-visibility pile-driving. If during low-visibility pile-driving, undetected animals are found in the clearance and/or shutdown zones, low-visibility pile-driving activities must cease as soon as possible in consideration of human safety, and applicable federal permitting agencies must be notified immediately. Low-visibility pile-driving must not restart until approval is provided by applicable federal permitting agencies unless visibility improves to normal conditions. 2. **Nighttime Pile-Driving Monitoring**: This part of the plan must demonstrate the capability of the proposed monitoring methodology to detect marine mammals and sea turtles within the full extent of the established clearance and shutdown zones (i.e., species can be detected at the same distances and with similar confidence) with the same effectiveness as daytime visual monitoring (i.e., same detection probability). Only devices and methods demonstrated as being capable of detecting marine mammals and sea turtles to the maximum extent of the clearance and shutdown zones will be acceptable. This part of the plan will include the following components: identification of nighttime monitoring devices (e.g., vessel-mounted thermal IR camera systems, handheld or wearable NVDs, handheld IR imagers); the Lessee must discuss the efficacy (range and accuracy) of each device proposed for nighttime monitoring as demonstrated in field trials. The plan must include procedures and timeframes for notifying the applicable federal permitting agencies of the Lessee's intent to pursue nighttime foundation pile-driving, and reporting procedures, contacts, and timeframes. The Nighttime Pile-Driving Monitoring part would be reviewed by both NMFS and BOEM. Factors for review will be developed by NMFS and BOEM at the project stage. If the Nighttime Pile-Driving Monitoring part of the plan is not accepted, foundation pile-driving may commence only during daylight hours and no earlier than 1 hour after civil sunrise. Foundation pile-driving may not be initiated any later than 1.5 hours before civil sunset and may continue after dark only when the installation of that pile began during daylight hours and must proceed for human safety or installation feasibility reasons. If the Nighttime Pile-Driving Monitoring part of the plan is accepted, in addition to foundation pile-driving commencing during daylight hours, new piles may be initiated outside of the previously defined daylight hours (1 hour after civil sunrise to 1.5 hours before civil sunset) to meet schedule requirements.			
MMST-2	Impact Pile-Driving Monitoring Plan	In the case where low noise foundation types are not practicable and impact pile-driving is required, Lessees must submit a final Pile-Driving Monitoring Plan (PDM Plan) to BOEM (renewable_reporting@boem.gov), BSEE (via TIMSWeb and protectedspecies@bsee.gov), and NMFS for review 120 days prior to the commencement of pile-driving activities. The Lessee must resolve all comments to BOEM and BSEE's satisfaction on the plan before operations can begin, and operations must be conducted according to the plan. The plan will detail all plans and procedures for any noise mitigation used, as well as for monitoring ESA-listed whales and sea turtles during all impact and vibratory pile-driving. The PDM Plan must: 1. Contain information on the visual and PAM components of the monitoring describing all equipment, procedures, and protocols. 2. Demonstrate that the PAM system has a near-real-time capability of detection to the full extent of the 160 dB distance from the pile-driving location. 3. Include a detection confidence that a vocalization originated from within the clearance and shutdown zones to determine that a possible NARW has been detected. Any PAM detection of a NARW within the clearance/shutdown zone surrounding a pile must be treated the same as a visual observation and trigger any required delays in pile installation. 4. Ensure that the full extent of the harassment distances from piles are monitored for marine mammals and sea turtles to document all potential take. 5. Include number of PSOs that will be used, the platforms or vessels upon which they will be deployed, and contact information for the PSO providers. 6. Include an Alternative Monitoring Plan (see MMST-1) that provides for enhanced monitoring capabilities in the event that poor visibility conditions unexpectedly arise, and pile-driving cannot be stopped.	Marine Mammals, Sea Turtles	BOEM, BSEE, and NMFS	

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		7. Describe a communication plan detailing the chain of command, mode of communication, and decision authority. 8. Include reporting PSO and crew member/equipment operator titles and responsibilities, including who makes determinations of equipment shutdown feasibility. PSOs as determined by NMFS and BOEM must be used to monitor the area of the clearance and shutdown zones. Seasonal and species-specific clearance and shutdown zones must also be described in the PDM Plan including time-of-year requirements for NARWs. A copy of the approved PDM Plan must be in the possession of and followed by the Lessee Representative, the PSOs, impact-hammer operators, and any other relevant designees operating under the authority of the approved COP and carrying out the requirements on site.			
MMST-3	Pile-driving clearance and shutdown zone adjustments	In order for pile-driving clearance and/or shutdown zones to be decreased, the Lessee must request modification of the clearance and shutdown zones based on Thorough Sound Field Verification (MUL-29) measurements at a minimum of three foundations, which must meet the Received Sound Level Limit (MUL-22), when effective, as well as minimum seasonal distances for threatened and endangered species that may be specified in the Biological Opinion. If Sound Field Verification (SFV) measurements indicate that the isopleths of concern are larger than those considered in the Proposed Action for the COP NEPA analysis, the Lessee must, in coordination with applicable federal permitting agencies, implement additional sound attenuation measures before driving any additional piles and conduct Thorough Sound Field Verification (MUL-29) for the subsequent three foundation installations. The Lessee must submit the results of the field measurements to BOEM, BSEE, NMFS, and USACE (when applicable) within 48 hours. The agencies will provide direction to the Lessee on whether any additional modifications are required.	Marine Mammals, Sea Turtles	BOEM, BSEE, and NMFS	
MMST-4	Establishment of foundation pile-driving measures	The following measures apply to all foundation pile driving activities: 1. Time of Day Restrictions: Foundation pile-driving may commence only during daylight hours unless an Alternative Monitoring Plan has been submitted and approved (see MMST-1). Foundation pile-driving may begin no earlier than 1 hour after (civil) sunrise. Foundation pile-driving may not be initiated any later than 1.5 hours before (civil) sunset. Foundation pile-driving may continue after dark only when the installation of the same pile began during daylight hours (1.5 hours before civil sunset), when clearance zones were fully visible for at least 30 minutes and only when they must proceed for human safety or installation feasibility reasons. 2. The Lessee must deploy at least two PSOs on duty on the foundation pile-driving platform, or nearby construction vessel in the immediate vicinity of the foundation pile-driving platform, at all times during foundation pile-driving to visually monitor for marine mammals. 3. Monitoring must take place from 30 minutes immediately prior to initiation of foundation pile-driving activity through 30 minutes post-completion of foundation pile-driving activity. 4. For all foundation pile-driving activity, the Lessee must follow designated clearance zones. 5. Foundation pile-driving may only commence when the clearance zones are fully visible (e.g., not obscured by darkness, rain, fog), unless an Alternative Monitoring Plan (see MMST-1) has been submitted and approved, and only when clearance zones are clear of marine mammals for at least 30 minutes immediately prior to foundation pile-driving, as determined by the lead PSO. 6. If a marine mammal is visually detected entering or within designated shutdown zones after foundation pile-driving has commenced, a shutdown of foundation pile-driving must be implemented. 7. Following a shutdown, foundation pile-driving may not commence until appropriate conditions (i.e., measures 1–5 above) have been met. 8. Pile-driving of wind turbine foundations and OSSs in the wind development area must not occur from January 1 through April 30. Impact pile-driving must not occur in December unless unanticipated delays due to weather or technical problems arise, notified to and approved by BOEM, that necessitate extending impact pile-driving into December. **For sea turtles:** To ensure that foundation pile-driving operations are carried out in a way that minimizes the exposure of listed sea turtles to noise that may result in injury or behavioral disturbance, PSOs will establish a 1,640-foot (500-meter) shutdown zone for all foundation pile-driving activities. Adherence to the 1,640-foot (500-meter) shutdown zones must be reflected in the PSO reports. Any visual detection of sea turtles within the 1,640-foot (500-meter) shutdown zones must trigger the required shutdown in pile installation. Upon a visual detection of a sea turtle entering or within the shutdown zone during foundation pile-driving, the Lessee must shut down the pile-driving hammer (unless activities must proceed for human safety or for concerns of installation feasibility) from when the PSO observes, until: 1. The lead PSO verifies that the animal(s) voluntarily left and headed away from the clearance area; or	Marine Mammals, Sea Turtles	BOEM, BSEE, and NMFS	✓

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		2. 30 minutes have elapsed without re-detection of the sea turtle(s) by the lead PSO. Additionally, if shutdown is called for but the Lessee determines shutdown is not technically feasible due to human safety concerns or to maintain installation feasibility, reduced hammer energy must be implemented when the lead engineer determines it is technically feasible to do so.			
MMST-5	PSO coverage of expanded clearance/shutdown zones	Lessees must ensure that if the clearance and/or shutdown zones are expanded, PSO coverage is sufficient to reliably monitor the expanded clearance and/or shutdown zones. Additional observers must be deployed on additional platforms for every 4,921 feet (1,500 meters) that a clearance or shutdown zone is expanded beyond the distances modeled prior to verification.	Marine Mammals, Sea Turtles	BOEM, BSEE, and NMFS	✓
MMST-6	Pile-driving visibility requirements	PSOs must have effective visual monitoring in all directions, and pile-driving must not commence until all clearance zones are fully visible (i.e., are not obscured by darkness, rain, fog, etc.) for at least 30 minutes. Unless otherwise authorized under an approved Alternative Monitoring Plan, construction activities must not be initiated until the full extent of all clearance zones are fully visible if conditions (e.g., darkness, rain, fog) prevent the visual detection of marine mammals in the clearance zones. The lead PSO will make a determination as to when there is sufficient light to ensure effective visual monitoring can be accomplished in all directions. The Lessee must develop and implement measures for alternative monitoring in the event that poor visibility conditions unexpectedly arise, and pile-driving cannot be stopped due to safety or operational feasibility. The Lessee must operate according to the Alternative Monitoring Plan (see MMST-1). This plan will include deploying additional observers; alternative monitoring technologies such as night vision, thermal, and infrared technologies; or use of PAM with the goal of ensuring the ability to maintain all clearance and shutdown zones for all ESA-listed species in the event of unexpected poor visibility conditions.	Marine Mammals, Sea Turtles	BOEM, BSEE, and NMFS	✓
MMST-7	PSO coverage and training requirements	Lessees must ensure that PSO coverage is sufficient to reliably detect whales and sea turtles at the surface in clearance and shutdown zones to execute any pile-driving delays or shutdown requirements. If, at any point prior to or during construction, the PSO coverage that is included as part of the Proposed Action for the COP NEPA analysis is determined not to be sufficient to reliably detect ESA-listed whales and sea turtles within the clearance and shutdown zones, additional PSOs and/or platforms will be deployed. Determinations prior to construction will be based on review of the Pile-Driving Monitoring Plan. Determinations during construction will be based on review of the weekly pile-driving reports and other information, as appropriate. PSOs must be provided by a third-party provider. While on duty, PSOs must have no tasks other than to conduct observational effort, collect and report data, and communicate with and instruct relevant vessel crew with regard to the presence of marine mammals and mitigation requirements (including brief alerts regarding maritime hazards). PSOs and/or PAM operators must have completed a commercial PSO training program for the Atlantic with an overall examination score of 80% or greater (Baker et. Al 2013).[2] Training certificates for individual PSOs must be provided to BOEM upon request. PSOs and PAM operators must be approved by NMFS prior to the start of a survey. Application requirements to become an NMFS-approved PSO for construction activities can be found at https://www.fisheries.noaa.gov/new-england-mid-atlantic/careers-and-opportunities/protected-species-observers, or for geophysical and geotechnical surveys by sending an inquiry to nmfs.psoreview@noaa.gov. The Lessee must provide to BOEM, upon request, documentation of NMFS approval for individual PSOs. For the following activities, lead PSOs must be deployed as part of the minimum number of PSOs as follows: at least one lead PSO must be on duty at any given time as the lead PSO or PSO monitoring coordinator during pile-driving; at least one lead PSO must be present on each HRG survey vessel; PSOs on transit vessels must be trained, but do not need to be authorized as a lead PSO. Any required lead PSOs must have prior approval from NMFS to be a lead or unconditionally approved PSO. PSOs on duty must be clearly listed on daily data logs for each shift. A sufficient number of PSOs must be deployed to record data in real time and effectively monitor the affected area for the project, including visual surveys in all directions around a pile, PAM, and continuous monitoring of sighted NARWs in the area to meet the number of PSOs required for enhanced seasonal monitoring requirements. PSOs must not be on watch for more than 4 consecutive hours, with at least a 2-hour break after a 4-hour watch. PSOs must not work for more than 12 hours in any 24-hour period (Baker et. Al 2013) unless an alternative schedule is approved by BOEM. Visual monitoring must occur from the most appropriate vantage point on the associated operational platforms that allows for 360-degree visual coverage around a vessel.	Marine Mammals, Sea Turtles	BOEM, BSEE, and NMFS	✓

[2] Baker, K., Epperson, D., Gitschlag, G. R; Goldstein, H., Lewandowski, J., Skrupky, K., Smith, B., Turk, T. 2013. National standards for a Protected Species Observer and Data Management Program : a model using geological and geophysical surveys. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. NOAA technical memorandum NMFS-OPR.

Measure ID[1]	Measure Name	Description	Resource Area Mitigated	Anticipated Enforcing Agency	Previously Applied as a COP Term and Condition
		The Lessee must ensure that suitable equipment is available to PSOs including binoculars, range-finding equipment, a digital camera, and electronic data recording devices (e.g., a tablet) to adequately monitor the distance of the clearance and shutdown zones, to determine the distance to protected species during surveys, to record sightings and verify species identification, and to record data. Observations must be conducted while free from distractions and in a consistent, systematic, and diligent manner.			
MMST-9	Vessel crew and Protected Species Observer (PSO) training requirements	The Lessee must provide project-specific training to all vessel crew members, PSOs, and trained lookouts on the identification of sea turtles and marine mammals, vessel strike avoidance and reporting protocols, how and when to communicate with the vessel captain, the authority of the PSOs, and the associated regulations for avoiding vessel collisions with protected species prior to the start of in-water construction or detonation activities. The Lessee must make reference materials for identifying sea turtles and marine mammals available aboard all project vessels. Confirmation of the training and understanding of the requirements must be documented on a training course log sheet, and the Lessee must provide the log sheets to BOEM and BSEE upon request. The Lessee must communicate to all crew members its expectation for them to report sightings of sea turtles and marine mammals to the designated vessel contacts. The Lessee must communicate the process for reporting sea turtles and marine mammals (including live, entangled, and dead individuals) to the designated vessel contact and all crew members. The Lessee must post the reporting instructions, including communication channels, in highly visible locations aboard all project vessels.	Marine Mammals, Sea Turtles	BOEM and BSEE	✓
MMST-10	PSO reporting requirements for pile-driving shutdown events	Within 24 hours, the Lessee must report to BOEM (renewable_reporting@boem.gov) and BSEE (TIMSWeb and protectedspecies@bsee.gov) all marine mammals and/or sea turtles in the shutdown zone that resulted in a shutdown or a power-down as well as when a shutdown or power-down was requested but not implemented due to safety/operations preventing a shutdown from occurring. In addition, the PSO provider must submit the daily data report (raw data collected in the field) and must include the daily PSO reporting requirements as described in MUL-32.	Marine Mammals, Sea Turtles	BOEM, BSEE, and NMFS	✓
MMST-12	Marine mammal and sea turtle geophysical survey clearance and shutdown zones and mitigations	The following pre-start clearance and shutdown zones shall be implemented when the following sources are in use: bubble guns, 1- and 2-plate boomers, and high-powered sparkers. The following sources would not require such mitigations: • Multibeam echosounders (hull-mounted or portable) • Side-scan sonars • Hull-mounted non-parametric SBPs (e.g., Knudsens) • Parametric shallow penetration SBPs (e.g., Innomars) • Fathometers for navigation • Towed non-parametric SBPs/Chirp systems (e.g., Edgetech 424, Edgetech 512i) • EK60/EK80 split-beam echosounders • 3-plate boomers • Pingers (acoustic locators) for locating over the side wireline instrumentation in the water column • Acoustic releases (brief duration pinging), e.g., for moorings, landers, OBS • Ultra-short baseline (USBL) and long baseline (LBL) positioning equipment, e.g., for navigation of submersibles, ROVs. • All acoustic Doppler current profiling (ADCP) equipment • All instrumentation on HOV/AUV/ROVs • Pressure-equipped inverted echo sounders (PIES) and Pressure Monitoring Transducers (PMTs) • Electromagnetic sources • All instruments operated at 180 kHz or greater A minimum of one PSO must be on duty during daylight hours: 30 minutes before sunrise to 30 minutes after sunset (see specific details on PSO requirements below). The PSO must observe the pre-start clearance zone for 30 minutes before sound sources are turned on and must maintain watch while sound sources are active. If an animal is detected within the pre-start clearance zone, it must be observed exiting before the source can be turned on, or if not detected, the team must wait 30 minutes, with no other detections within the pre-start clearance zone, before the sources may be turned on. When sound sources are turned on, the operator should use a “ramp-up” procedure if possible: sources should be at half power for 5 minutes, before proceeding to full power. If the acoustic source is shut down for less than 30 minutes for reasons other than implementation of prescribed mitigation (e.g., mechanical difficulty), it may be activated again without ramp-up if PSOs have	Marine Mammals, Sea Turtles	BOEM, BSEE, and NMFS	✓

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		maintained constant visual observation and no detections of protected species have occurred within their respective shutdown zones. For any longer shutdown, pre-start clearance observation and ramp-up are required. If an animal enters its respective shutdown zone while the source is active, the source must be immediately shut down. If the shutdown was a result of a marine mammal, the source may be reactivated after the animal has been observed exiting the pre-clearance zone, or, if not detected, the team must wait 30 minutes before the source may be turned back on with no detections within the shutdown or pre-start clearance zones. For sea turtles, there is no need to wait for the turtle to leave the pre-start clearance zone and no need to wait 30 minutes if not detected after the initial sighting before turning the source back on after a shutdown (i.e., it can be considered a brief "pause"). Shutdowns are not required for dolphins, porpoises, and pinnipeds. The pre-start clearance zone shall be 328 feet (100 meters) for all marine mammals and sea turtles, but under certain circumstances, a zone of 1,640 feet (500 meters) shall be used. These circumstances include detection of a NARW, beaked whales, dwarf and pygmy sperm whales, any baleen or sperm whale with a calf, and any group of six or more baleen whales or sperm whales. Observers must use accurate distance finding methods (e.g., reticle binoculars, range finding sticks, calibrated video cameras, and software) during their observations. Ramp-up may occur at times of poor visibility, including nighttime, if appropriate visual monitoring has occurred with no detections of protected species in the 30 minutes prior to beginning ramp-up. Acoustic source activation may only occur at night where operational planning cannot reasonably avoid such circumstances.			
MMST-13	Vessel speed requirements November 1 through May 14	From November 1 through May 14, all vessels must travel at 10 knots (18.5 kilometers per hour) or less when transiting to/from or within the wind development area, with the exception of crew transfer vessels as described below. From November 1 through May 14, crew transfer vessels may travel at more than 10 knots (18.5 kilometers per hour) if there is at least one visual observer on duty at all times aboard the vessel to visually monitor for large whales and real-time PAM is conducted. If a NARW is detected via visual observation or PAM within or approaching the transit route, all crew transfer vessels must travel at 10 knots (18.5 kilometers per hour) or less for the remainder of that day.	Marine Mammals, Sea Turtles	BOEM, BSEE, and NMFS	
MMST-14	Vessel strike mitigation measures for marine mammals and sea turtles	The Lessee must ensure that vessel operators and crews maintain a vigilant watch for all marine mammals and sea turtles and slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any such animals if it is safe to do so. Visual observers monitoring the vessel strike avoidance zone can be either PSOs or trained crew members (if PSOs are not required) and must be posted during all times a vessel is underway (transiting or surveying). If the trained lookout is a vessel crew member, this must be their designated role and primary responsibility while the vessel is transiting. Any designated crew lookouts must receive training on protected species identification, vessel strike minimization procedures, how and when to communicate with the vessel captain, and reporting requirements. Additionally, all vessel crew members must be briefed in the identification of ESA-listed species and marine mammals that may occur in the area and in regulations and best practices for avoiding vessel collisions, as well as the expectations and process for reporting. All observations must be recorded per reporting requirements. Vessel personnel must do the following to avoid causing injury or death to marine mammals and sea turtles: • Maintain a vigilant watch for marine mammals and sea turtles and slow down or stop their vessel to avoid striking protected species. • Notify the vessel captain of any whale within 1,640 feet (500 meters) of the vessel and immediately implement strike-avoidance procedures to maintain a separation distance of 1,640 feet (500 meters) from all listed species of whales including changing vessel direction or reducing vessel speed to allow the animal to travel away from the vessel. Any time a listed whale is within 656 feet (200 meters) of an underway vessel, a full stop is required if safety permits. If a whale is observed but cannot be confirmed as a species other than a NARW, the vessel operator must assume that it is a NARW and take appropriate action to avoid the animal. • When sea turtles, small cetaceans, or seals are sighted, attempt to maintain a minimum separation distance of 164 feet (50 meters) to the maximum extent practicable with an exception made for those animals that approach the vessel. The vessel must act as necessary to avoid violating the separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If animals are sighted within the separation distance, the vessel must reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. • Vessels underway must not divert their course to approach any listed species. • Regardless of vessel size, vessel operators must reduce vessel speed to 10 knots (18.5 kilometers per hour) or less while operating in any Seasonal Management Area (SMA) and Dynamic Management Area (DMA) (or Slow Zone otherwise designated as a DMA). • All vessel operators must check for information regarding mandatory or voluntary ship strike avoidance (DMAs and SMAs) and daily information regarding NARW sighting locations. These media may include, but are not limited to: NOAA weather radio, USCG NAVTEX and channel 16 broadcasts, Notices to Mariners, the Whale Alert app, or WhaleMap website. NARW Sighting Advisory System info can be accessed at https://whalemap.org/WhaleMap/.	Marine Mammals, Sea Turtles	BOEM, BSEE, and NMFS	✓

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		• Reduce vessel speed to 10 knots (18.5 kilometers per hour) or less when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel when safety permits. A single cetacean at the surface may indicate the presence of submerged animals in the vicinity of the vessel; therefore, precautionary measures should always be exercised. The only exception to these requirements is when the safety of the vessel or crew necessitates deviation from these requirements. If a vessel strike incident occurs, it must be reported within 24 hours according to appropriate requirements. The Lessee may file for consideration by a request for a waiver of any of these restrictions by submitting a vessel strike risk reduction plan that details revised measures along with an analysis to demonstrate that the measure(s) will provide a level of risk reduction at least equivalent to the measure(s) being proposed to be replaced. The plan must be provided at least 120 days prior to a request for approval and will not be implemented until approved.			
MUL-1	Marine debris awareness and elimination	"Marine trash and debris" is defined as any object or fragment of wood, metal, glass, rubber, plastic, cloth, paper or any other solid, human-made item or material that is lost or discarded in the marine environment by the Lessee or an authorized representative of the Lessee (collectively, the "Lessee") while conducting activities on the OCS in connection with a lease, grant, or approval issued by the BOEM or BSEE. To understand the type and amount of marine debris that may be generated, and to minimize the risk of entanglement in and/or ingestion of marine debris by protected species, the Lessee must implement the following: 1. Training: All vessel operators, employees, and contractors performing OCS survey activities on behalf of the Lessee (collectively, "Lessee Representatives") must complete marine trash and debris awareness training annually. The training consists of two parts: (1) viewing a marine trash and debris training video or slide show (described below) and (2) receiving an explanation from management personnel that emphasizes their commitment to the requirements. The marine trash and debris training videos, training slide packs, and other marine debris related educational material may be obtained at https://www.bsee.gov/debris. The training videos, slides, and related material may be downloaded directly from the website. Lessee representatives engaged in OCS survey activities must continue to develop and use a marine trash and debris awareness training and certification process that reasonably assures that they, as well as their respective employees, contractors, and subcontractors, are in fact trained. The training process must include the following elements: (a) viewing of either a video or slide show by the personnel specified above, (b) an explanation from management personnel that emphasizes their commitment to the requirements, (c) attendance measures (initial and annual), and (d) recordkeeping and availability of records for inspection by BSEE. 2. By January 31 of each year, the Lessee must submit to BSEE an annual report signed by the Lessee that describes its marine trash and debris awareness training process and certifies that the training process has been followed for the previous calendar year. The Lessee must send the reports via TIMSWeb and a notification email to BOEM (renewable_reporting@boem.gov) and BSEE (marinedebris@bsee.gov). 3. Marking: Materials, equipment, tools, containers, and other items used in OCS activities that are of such shape or configuration that are likely to snag or damage fishing devices or be lost or discarded overboard, must be clearly marked with the vessel or facility identification number, and properly secured to prevent loss overboard. All markings must clearly identify the owner and must be durable enough to resist the effects of the environmental conditions to which they may be exposed. 4. Recovery: Lessees must recover marine trash and debris that is lost or discarded in the marine environment while performing OCS activities when such incident is likely to: (a) cause undue harm or damage to natural resources, including their physical, atmospheric, and biological components, with particular attention to those that could result in the entanglement of or ingestion by marine protected species; or (b) significantly interfere with OCS uses (e.g., are likely to snag or damage fishing equipment, or present a hazard to navigation). Lessees must notify BSEE when recovery activities are (i) not possible because conditions are unsafe or (ii) not practicable because the marine trash and debris released is not likely to result in any of the conditions listed in (a) or (b) above. 5. The Lessees must recover the marine trash and debris lost or discarded if BSEE does not agree with the reasons provided by the Lessee as to why it should be relieved from the obligation to recover the marine trash and debris. If the marine trash and debris is lost or discarded within the boundaries of a potential archaeological resource/avoidance area, or a sensitive ecological/benthic resource area, the Lessee must contact BSEE for approval prior to conducting any recovery efforts. Recovery of the marine trash and debris should be completed immediately, but no later than 30 days from the date in which the incident occurred. If the Lessee is not able to recover the marine trash or debris within 48 hours, the Lessee must submit a recovery plan to BSEE explaining the recovery activities to recover the marine trash or debris ("Recovery Plan"). 6. The Recovery Plan must be submitted no later than 10 calendar days from the date in which the incident occurred. Unless otherwise objected to by BSEE within 48 hours of the submittal listed as In Review status in TIMSWeb, the Lessee can proceed with	Benthic; Finfish, Invertebrates, and EFH; Marine Mammals; Water Quality; Sea Turtles	BOEM and BSEE	✓

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		the activities described in the Recovery Plan. The Lessee must request and obtain approval of a time extension if recovery activities cannot be completed within 30 days from the date in which the incident occurred. The Lessee must enact steps to prevent similar incidents and must submit a description of these actions to BOEM and BSEE within 30 days from the date on which the incident occurred. 7. Reporting: The Lessee must report all marine trash and debris lost or discarded to BSEE (using the email address listed on BSEE's most recent incident reporting guidance). This report applies to all marine trash and debris lost or discarded, and must be made monthly, no later than the fifth day of the following month. The report must include the following: a. Project identification and contact information for the Lessee, operator, and/or contractor; b. Date and time of the incident; c. The lease number, OCS area and block, and coordinates of the object's location (latitude and longitude in decimal degrees); d. A detailed description of the dropped object to include dimensions (approximate length, width, height, and weight) and composition (e.g., plastic, aluminum, steel, wood, paper, hazardous substances, or defined pollutants); e. Pictures, data imagery, data streams, and/or a schematic/illustration of the object, if available; f. Indication of whether the lost or discarded item could be a magnetic anomaly of greater than 50 nanotesla (nT), a seafloor target of greater than 1.6 feet (0.5 meter), or a sub-bottom anomaly of greater than 1.6 feet (0.5 meter) when operating a magnetometer or gradiometer, side scan sonar, or sub-bottom profile in accordance with BSEE's applicable guidance; g. An explanation of how the object was lost; and h. A description of immediate recovery efforts and results, including photos. In addition to the foregoing, the Lessee must submit a report within 48 hours of the incident ("48-hour Report") if the marine trash or debris could: a. Cause undue harm or damage to natural resources, including their physical, atmospheric, and biological components, with particular attention to those that could result in the ingestion by or entanglement of marine protected species; or b. Significantly interfere with OCS uses (e.g., are likely to snag or damage fishing equipment, or present a hazard to navigation). The information in the 48-hour Report would be the same as that listed above, but just for the incident that triggered the 48-hour Report. The Lessee must report to BSEE if the object is recovered and, as applicable, any substantial variation in the activities described in the Recovery Plan that were required during the recovery efforts. Information on unrecovered marine trash and debris must be included and addressed in the description of the site clearance activities provided in the decommissioning application required under 30 CFR 585.906. The Lessee is not required to submit a report for those months in which no marine trash and debris was lost or discarded.			
MUL-2	Anchoring plan	Lessees must submit an anchoring plan for all areas where anchoring is being used during construction, operations, and decommissioning to avoid or minimize impacts on sensitive habitats, including hardbottom and structurally complex habitats. The plan will require that the Lessee consider any new data on benthic habitats and cultural resources to avoid/minimize impacts on these resources to the maximum extent practicable. The anchoring plan must include the planned location of anchoring activities, sensitive habitats and locations, seabed features, potential hazards, and any related facility installation activities such as cables, WTGs, and OSSs, as appropriate. It will require all vessels deploying anchors to use, whenever feasible and safe, mid-line anchor buoys to reduce the amount of anchor chain or line that touches the seafloor. The Lessee must provide the anchoring plan to BOEM and BSEE to coordinate with NMFS for a 60-day review at least 120 days before anchoring activities and construction begins. The Lessee must resolve all comments on the anchoring plan to BOEM and BSEE's satisfaction before conducting any OCS seabed-disturbing activities that require anchoring. For operations and decommissioning, the Lessee must provide proposed anchoring plats to BOEM and BSEE for review and concurrence before anchoring activities occur. The proposed anchoring plats must include avoidances identified above and as-placed anchor plats must be submitted to BOEM and BSEE within 90 days of completion of an activity (including during operations) or construction of a major facility component (e.g., buoys, export cable installation, WTG or OSS installation and interarray cable installation) or decommissioning to demonstrate that seabed-disturbing activities complied with avoidance requirements for seabed features and hazards, archaeological resources, and/or anomalies. As-placed plats must show the "as-placed" location of all anchors and any associated anchor chains and/or wire ropes and relevant locations of interest or avoidance on the seabed for all seabed-disturbing activities. The plats must be at a scale of 1 inch = 1,000 feet (300 meters) with Differential GPS accuracy.	Benthic; Commercial and For-Hire Fishing; Finfish, Invertebrates, and EFH; Water Quality	BOEM, BSEE, and NMFS	✓
MUL-3	Berm survey and report	Where plows, jets, grapnel runs, or other similar methods are used, post-construction surveys capable of detecting bathymetry changes of 1.6 feet (0.5 meter) or less must be completed to determine the height and width of any created berms. If there are bathymetric	Benthic; Finfish, Invertebrates, and EFH	BOEM and BSEE	✓

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		changes in berm height greater than 3.3 feet (1 meter) above grade, the Lessee must develop and implement a Berm Remediation Plan to restore created berms to match adjacent natural bathymetric contours (isobaths), as technically and/or economically practical or feasible. The Lessee must submit the Berm Remediation Plan to BOEM and BSEE to coordinate with NMFS for a 60-day review within 90 days of completion of the post-construction survey where the change was detected. BOEM and BSEE will also review the plan to determine if the scope of activities (e.g., methods, disturbance area, vessel trips, emissions) is within the already completed COP-specific NEPA analysis and ESA and EFH consultations and, if not, will complete additional environmental review and consultations. The Lessee must resolve all comments on the Berm Remediation Plan to BOEM and BSEE's satisfaction prior to initiating restoration activities. The final version of the Berm Remediation Plan must be provided to BOEM, BSEE, NMFS, and USACE.			
MUL-4	Final cable protection in hardbottom	Cable protection measures within complex hardbottom habitat must consist of natural or engineered stone that does not inhibit epibenthic growth and provides three-dimensional complexity, both in height and in interstitial spaces. The Lessee will also be required to consider nature-inclusive designs for optimized cable protection (Hermans et al. 2020),[3] including those that consist of natural materials that mimic the surrounding seafloor. The Lessee must coordinate with NMFS and BOEM prior to the implementation of hardbottom cable protection measures. BOEM will make recommendations regarding the final selection of engineered stone in coordination with NMFS. The effectiveness of natural and engineered stone as a mitigation measure will be evaluated/monitored as a component of a finalized benthic monitoring plan.	Benthic; Finfish, Invertebrates, and EFH	BOEM, BSEE, and NMFS	✓
MUL-5	Low noise best practices	For onshore and offshore project activities and across all phases of construction and operations, operators should use equipment, technology, and best practices that produce the least amount of noise practicable to avoid and minimize noise impacts on the environment. See the following as examples: low noise foundation (MUL-6), vessel noise reduction BMP (MUL-7), and the received sound level limit (MUL-22).	Bats; Benthic; Birds; Coastal Habitat and Fauna; Commercial and For-Hire Fishing; Finfish, Invertebrates, and EFH; Land Use and Coastal Infrastructure; Marine Mammals; Recreation and Tourism; Sea Turtles	Voluntary	
MUL-6	Low noise foundations	BOEM encourages the use of low noise practices in foundation installation. The use of non-pile-driving foundation types should be considered first. If not practicable, then the use of the best available quieting technology should be applied to reach the received sound level limit (MUL-22).	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	Voluntary	
MUL-7	Vessel noise reduction guidelines	The Lessee should, to the extent reasonable and practicable, follow the most current International Maritime Organization's (IMO) Guidelines for the reduction of underwater radiated noise, including propulsion noise, machinery noise and dynamic positioning systems of any vessel associated with the project.	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	Voluntary	
MUL-8	Gear identification	To facilitate identification of gear on any entangled animals, all trap/pot gear used in the surveys must be uniquely marked to distinguish it from other commercial or recreational gear. Using yellow and black striped duct tape, place a 3-foot-long mark within 2 fathoms of a buoy. In addition, using black and white paint or duct tape, place three additional marks on the top, middle, and bottom of the line. These gear marking colors are proposed as they are not gear markings used in other fisheries and are therefore distinct. Any changes in marking would not be made without notification and approval from NMFS.	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	✓
MUL-9	Lost survey gear	If any survey gear is lost, all reasonable efforts that do not compromise human safety must be undertaken to recover the gear. All lost survey gear must be reported to NMFS (nmfs.gar.incidental-take@noaa.gov) and BSEE (marinedebris@bsee.gov) within 24 hours of the documented time of missing or lost gear. This report must include information on any markings on the gear and any efforts undertaken or planned to recover the gear.	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	✓
MUL-10	Data collection PDC and BMPs	Lessees must ensure that all PDCs and BMPs included in BOEM's Project Design Criteria (PDC) and Best Management Practices (BMPs) for Protected Species Associated with Offshore Wind Data Collection (or any subsequent updated versions of this document) found here: https://www.boem.gov/sites/default/files/documents//PDCs%20and%20BMPs%20for%20Atlantic%20Data%20Collection%2011222021.pdf are applied to activities associated with the construction, maintenance, and operations of the project, including all post-lease geophysical and geotechnical surveys carried out over the life of the lease, as applicable. These PDCs and BMPs collectively implement the ESA requirements for these offshore wind activities on the Atlantic OCS as of June 29, 2021.	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	

[3] Hermans, A, Bos, O.G., Prusina, I. 2020. Nature-Inclusive Design: a catalogue for offshore wind infrastructure. Technical Report 114266/20-004.274. The Ministry of Agriculture, Nature and Food Quality, Netherlands.

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MUL-12	Ecological design elements	Lessees are encouraged to incorporate ecological design elements into the project design where practicable. For example, nature-inclusive design products are an alternative to traditional concrete that enhance or encourage the growth of flora or fauna when placed in a marine environment and could result in reduced GHG emissions compared to traditional concrete. Another example is using nature-based scour protection such as oyster beds or artificial reefs.	Air Quality and Greenhouse Gas Emissions; Benthic; Coastal Habitat and Fauna; Commercial and For-Hire Fishing; Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	Voluntary	
MUL-13	Protected Species Training for trawl and trap survey staff	Lessees must ensure that at least one of the survey staff onboard the trawl surveys and ventless trap surveys has completed Northeast Fisheries Observer Program training (within the last 5 years) or other training in protected species identification and safe handling (inclusive of taking genetic samples from Atlantic sturgeon). Reference materials for identification, disentanglement, safe handling, and genetic sampling procedures must be available on board each survey vessel. The Lessee must prepare and submit to BOEM and BSEE a training plan that addresses how this requirement will be met, and the plan must be submitted to NMFS in advance of any trawl or trap surveys. This requirement is in place for any trips where gear is set or hauled.	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	
MUL-14	UXO avoidance	Lessees should develop and implement standard protocols for addressing unexploded ordnance (UXOs), including implementation of best available technology to avoid or minimize exposure of protected species and sensitive habitats. Where *in situ* disposal is demonstrated to be necessary for the project, the Lessee should consult with state and federal agencies regarding seasonal restriction windows or other precautions. The Lessee must avoid, to the maximum extent practicable, interactions with UXO/Munitions and Explosives of Concern (MEC). If avoidance is not possible, submitted plans should follow all guidance (see Munitions and Explosives of Concern Survey Methodology and In-Field Testing for Wind Energy Areas on the Atlantic Outer Continental Shelf (pnnl.gov) at: https://tethys.pnnl.gov/sites/default/files/publications/Carton-et-al-2017-BOEM.pdf; Supporting National Environmental Policy Act Documentation for Offshore Wind Energy Development Related to Munitions and Explosives of Concern and Unexploded Ordinances (MEC-UXO White Paper [boem.gov]) at: https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/MEC-UXO%20White%20Paper.pdf; and when finalized, the US Committee on the Marine Transportation System general guidance addressing MEC at: https://www.cmts.gov/assets/uploads/documents/DOT-OST-2023-0117-0001_attachment_1.pdf; or any other applicable regulation regarding interaction with UXO/MEC.	Commercial and For-Hire Fishing; Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, USEPA, and U.S. Navy	
MUL-15	Marine debris monitoring around WTG	Lessees must monitor and adaptively mitigate impacts associated with commercial, charter, and recreational gear lost from expected increases in fishing around WTG foundations by surveying at least 10 of the WTGs located closest to shore in the lease area annually. Surveys by remotely operated vehicles, divers, or other means will inform frequency and locations of marine debris. The results of the surveys will be reported to BOEM (renewable_reporting@boem.gov) and BSEE (marinedebris@bsee.gov) in an annual report submitted by April 30 for the preceding calendar year in which the survey is performed. Photographic and videographic materials must be provided on a drive. Reports must include daily survey reports that include the survey date, contact information of the operator, location, and pile identification number, photographic and/or video documentation of the survey and debris encountered, any animals sighted, and the disposition of any located debris (i.e., removed or left in place). Required data and reports may be archived, analyzed, published, and disseminated by BOEM.	Benthic; Commercial and For-Hire Fishing; Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM and BSEE	✓
MUL-16	Post-storm event monitoring plan	The Lessee must provide a plan for post-storm event condition monitoring of the facility infrastructure, foundation scour protection, and cables to BSEE for review at least 60 days prior to commencing installation activities. The Lessee must receive BSEE's concurrence prior to commencing installation activities. Plans may be submitted separately for the cables (including cable protection), WTG, and OSS. The plan must describe how the Lessee will measure and monitor environmental conditions and duration of storm events; specify the environmental condition thresholds (and their associated technical justification) above which post-storm event monitoring or mitigation is necessary; describe potential monitoring, mitigation, and damage identification methods; and state when the Lessee must notify BSEE of post-storm event related activities. At a minimum, post-storm event inspections must be conducted following a storm where conditions exceed one-half the design return period. For example, a WTG platform designed for 50-year environmental conditions must be inspected following a storm event with 25-year environmental conditions. BSEE reserves the right to require post-storm mitigations to address conditions that could result in safety risks and/or impacts on the environment.	Benthic; Commercial and For-Hire Fishing; Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM and BSEE	✓
MUL-18	Shared transmission corridor	Lessees should coordinate transmission infrastructure among projects. Where practicable, transmission infrastructure should use shared intra- and interregional connections, have requirements for meshed infrastructure, apply parallel routing with existing and proposed linear infrastructure (including export cables and other existing infrastructure such as power and telecommunication cables,	Benthic; Coastal Habitat and Fauna; Commercial and For-Hire Fishing;	Voluntary	

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		pipelines), and limit the combined footprint to minimize impacts and maximize potential capacity. Where possible, incorporate cable siting principles and routing measures for export cables and associated substations developed from the Atlantic Offshore Wind Transmission Study and the BOEM/DOE transmission planning effort, the NYSERDA's Offshore Wind Cable Corridor Constraints Assessment,[4] associated NYS Public Service Commission orders, and the results of other state and ISO/RTO transmission planning processes, to maximize the utility of Points of Interconnection (POIs). Lessees considering landfall in New Jersey should also comply with the results of the state agreement approach (SAA)[5] and any other future procurements resulting from similar initiatives.	Cultural Resources; Finfish, Invertebrates, and EFH; Marine Mammals; Navigation and Vessel Traffic; Sea Turtles; Wetlands		
MUL-19	Post-installation cable monitoring	The Lessee must conduct an inspection of each interarray, interconnector, and export cable to determine cable location, burial depths, the state of the cable, and site conditions within 6 months, following installation of a cable segment, and additional inspections within 1 year following completion of the initial post-construction inspection, and every 3 years thereafter. These surveys must also be conducted within 180 days of a storm event (as defined by the post-storm event monitoring plan, described in MUL-16). The Lessee must provide BSEE and BOEM with a cable monitoring report within 90 days following each inspection. Inspections of the interarray and export cables must include HRG methods, involving, for example, multibeam bathymetric survey equipment; and identify seabed features, natural and human-made hazards, and site conditions along federal sections of the cable routing. • If BSEE determines that conditions along the cable corridor warrant adjusting the frequency of inspections (e.g., due to changes in cable burial or seabed conditions that may impact cable stability or other users of the seabed), then BSEE may require the Lessee to submit a revised inspection schedule for review and concurrence. • If BSEE determines that burial conditions have deteriorated or changed significantly and remedial actions are warranted, BSEE will notify the Lessee that the Lessee must submit the following via TIMS Web within 90 days of being notified: a seabed stability analysis, a remedial action plan, and a schedule for completing remedial actions. All remedial actions must be consistent with the approved COP. BSEE will review the plan and schedule and provide any comments within 60 days of receiving the plan. The Lessee must resolve all comments to BSEE's satisfaction. • If the Lessee determines that burial conditions have deteriorated or changed significantly and remedial actions are warranted, the Lessee must submit the following to BSEE via TIMS Web within 90 days of making the determination: the data used to make the determination, a seabed stability analysis, a plan for remedial actions, and a schedule for the proposed work. All remedial actions must be consistent with those described in the approved COP. BSEE will review the plan and schedule and provide comments within 60 days, if applicable. The Lessee must resolve all comments to BSEE's satisfaction.	Benthic; Commercial and For-Hire Fishing; Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	✓
MUL-20	Soft start for impact pile-driving	Lessees must implement soft start techniques for any impact pile-driving. The soft start must include a minimum of 20 minutes of 4–6 strikes/minute at 10–20% of the maximum hammer energy but should not exceed the Received Sound Level Limit. Soft start is required at the beginning of driving a new pile and at any time following the cessation of impact pile-driving for 30 minutes or longer.	Benthic; Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	✓
MUL-21	Use of new and emerging technology [6]	Where practicable, Lessees are encouraged to employ best available technology or other measures to avoid or minimize potential impacts in both offshore and nearshore environments, including adopting new and emerging technologies. Examples include the use of jet plows, closed loop cooling systems, trenchless technology, gravity-based structures or foundation designs that do not rely on pile-driving, and MERLIN radar systems. In addition, Lessees should explore opportunities to upgrade/retrofit equipment to the best available technology if it becomes available during project operations.	Bats; Benthic; Birds; Coastal Habitat and Fauna; Commercial and For-Hire Fishing; Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles, Water Quality	Voluntary	
MUL-22	Received Sound Level Limit (RSLL)	Sound fields generated during impact pile-driving must not exceed NOAA Fisheries' Level A permanent threshold shift (PTS) limits for low frequency cetaceans (LFC) by the specified date and at the distances below. Every attempt must be made to reach the Received Sound Level Limit (RSLL) at 100% of foundations. ***Voluntary***: • May 1, 2025: After the first three foundations, no exceedance of RSLL beyond 4,921 feet (1,500 meters) from the foundation for 90% of remaining piles.	Benthic; Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	

[4] For a list of specific cable siting principles, refer to Section 4.1 in the Offshore Wind Cable Corridor Constraints Assessment at: https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Offshore-Wind/2306-Offshore-Wind-Cable-Corridor-Constraints-Assessment--completeacc.pdf.

[5] https://www.nj.gov/bpu/pdf/boardorders/2022/20221026/8A%20ORDER%20State%20Agreement%20Approach.pdf.

[6] Appendix B, *Supplemental Information and Additional Figures and Tables*, Section B.9 describes examples of new and emerging technologies that Lessees could research and consider for adoption as part of MUL-21.

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		Required: • May 1, 2026: After the first three foundations, no exceedance of RSLL beyond 4,921 feet (1,500 meters) from the foundation for 90% of remaining piles. • May 1, 2028: After the first three foundations, no exceedance of RSLL beyond 3,280 feet (1,000 meters) from the foundation for 90% of remaining piles. • May 1, 2030: After the first three foundations, no exceedance of RSLL beyond 2,460 feet (750 meters) from the foundation for 90% of remaining piles. On a case-by-case basis, BOEM may consider an exception to the RSLL if the Lessee provides sufficient written justification, as determined by BOEM, of why meeting the RSLL is not technically and commercially practicable. In these cases, compensatory mitigation (or similar) may be considered, such as operator contributions to research and monitoring, or similar, that reduce noise or contribute to a better understanding of noise reduction.			
MUL-23	Adjust project design to reduce impacts	Lessees must consider how to avoid or reduce potential impacts on important environmental resources, including sensitive habitats (e.g., Mid-Shelf Scarp, NJDEP-designated prime fishing grounds, hardbottom, SAV, ledges), by adjusting project design. Lessees must demonstrate this consideration through their initial COP submission or subsequent updated versions. At a minimum, project design adjustment considerations must include: • Utilizing shared cable crossing positions to reduce the overall seabed footprint and quantity of any additional cable protection materials; • Using cable installation methods, such as horizontal directional drilling, that avoid and minimize adverse impacts on sensitive habitats and difficult-to-replace resources; • Avoiding routing export cables through estuaries and embayments to reduce impacts on numerous sensitive habitats and difficult-to-replace resources as well as many sensitive life stages of various species; • Ensuring all mooring systems and ancillary equipment are contained inside the approved lease area to reduce impacts on fishing, navigation, and other uses; • Adjusting turbine layout or co-locating ancillary equipment to avoid sensitive habitats; • Using outputs from marine mammal vessel strike models to inform project design; • Considering all potential WTG positions to allow for flexibility in project design due to identification of sensitive habitats or cultural properties through the environmental review process; and • Using micrositing as a tool for identifying and avoiding sensitive habitats.	Bats; Benthic; Birds; Coastal Habitat and Fauna; Commercial and For-Hire Fishing; Finfish, Invertebrates, and EFH; Marine Mammals; Wetlands; Sea Turtles	BOEM, BSEE, and NMFS	
MUL-24	Adaptive management for NMFS Trust Resources	Lessees must develop an adaptive management plan to resolve unanticipated issues and integrate new information. The adaptive management plan must be finalized prior to initiating construction activities. This plan should include the following: • Defining thresholds above which environmental impacts would be deemed unacceptable and how adaptive management will be implemented for review and approval by BOEM and BSEE; • Adhering to all relevant Time of Year Restrictions (TOYRs) for protected species present in the area and minimizing impacts if work must occur within TOYRs; • Considering no-build migratory routing measures for protected species already under threat, including for the NARW; and • Implementing the precautionary principle for sensitive habitats, including setbacks from important spawning areas, fishery rotational and access management areas, and other critical habitat.	Commercial and For-Hire Fishing; Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM and BSEE	
MUL-25	Consistent turbine layout, markings, and lighting	Lessees should employ consistent turbine grid layouts, spacing, markings, and lighting among lease areas to minimize navigational hazards and facilitate other ocean uses such as fishing and recreational activities. Turbines should have one of the two lines of orientation per lease stipulation spaced at least 1 nautical mile (1.9 kilometers) apart to support navigation safety and Search and Rescue (SAR). This recommended spacing is based on the USCG's 2020 Massachusetts and Rhode Island Port Access Route Study (https://www.navcen.uscg.gov/sites/default/files/pdf/PARS/FINAL_REPORT_PARS_May_14_2020.pdf). The spacing would also preserve structure-free areas to facilitate seabird passage and fishing operations. Also, per lease stipulations, adjacent lease areas that do not adopt the same layout must have an additional setback from shared borders. In accordance with BOEM lighting and marking guidelines, and USCG and FAA lighting and marking requirements, Lessees must ensure that all structures are properly marked and lighted.	Bats, Birds, Commercial and For-Hire Fishing, Marine Mammals, Navigation and Vessel Traffic	BOEM and USCG	
MUL-26	Monitoring plan	Lessees must develop and execute an environmental monitoring plan for resources and parameters that may be impacted by the project's activities (especially where known impacts are expected). This monitoring plan should cover resources that are not covered by	Benthic; Coastal Habitat and Fauna; Commercial	BOEM, BSEE, and NMFS	

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		other resource-specific monitoring plans. The environmental monitoring plan must be finalized prior to initiating construction activities. If the projected impact levels, as informed by future monitoring results, deviate substantially from the effects analysis in the COP NEPA document, the Lessees must transmit to BOEM and BSEE recommendations for new mitigation measures and/or monitoring methods for review and concurrence. The following should be considered: • The monitoring plan should meet regional data requirements and standards, such as ROSA Offshore Wind Project Monitoring Framework and Guidelines, the Regional Wildlife Science Collaborative's Draft Science Plan, and the NMFS/BOEM Federal Survey Mitigation Implementation Strategy, and can include, but not be limited to, monitoring of biological resources, atmospheric and oceanographic conditions, changes to fisheries performance, project-specific monitoring needs, and relevant new and emerging issues. • The monitoring plan should include a description of the potentially affected resources and the efforts that will be made to monitor those resources over time (i.e., pre-, during, and post-construction). • Monitoring efforts should favor approaches that are not extractive or lethal for the resources involved, where practicable, and will be in compliance with appropriate research permitting requirements. • Coordination of monitoring efforts across lease areas in the NY Bight is highly encouraged to maximize efficiencies in monitoring efforts, especially at a regional scale. • Results from monitoring should be made publicly available.	and For-Hire Fishing; Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles		
MUL-27	Minimize sediment disturbance	Lessees must employ methods to minimize sediment disturbance, including, but not limited to, the use of midline buoys to prevent cable sweep, not side-casting materials, and removal and reuse of dredged material for backfill or other beneficial use.	Benthic; Finfish, Invertebrates, and EFH; Water Quality; Sea Turtles	BOEM, BSEE, and NMFS	
MUL-28	Inadvertent Returns (IR) Plan and drilling fluids	Lessees should develop an Inadvertent Returns (IR) Plan to address prevention, control, and clean-up of potential IR, which is the unintended release of drilling fluids to the surface during drilling operations. To the extent practicable, use biodegradable drilling solution, and recirculate and recycle drilling fluids used during HDD construction to minimize required water use. Avoid discharging drilling fluids onto the seabed.	Benthic; Finfish, Invertebrates, and EFH; Water Quality	Voluntary/Outside of BOEM jurisdiction	
MUL-29	Sound Field Verification (SFV) Process, Plan and Reporting	The purpose of the SFV Process is to (1) verify the RSLL has been reached, and (2) document sound propagation from foundation installation for estimating distances to isopleths of potential injury and harassment to verify that the modeled acoustic fields were conservative enough to not underestimate the number of exposures of protected marine life to sounds over regulatory thresholds. **Process** SFV must be conducted at every pile at 2,460 feet (750 meters) (Abbreviated SFV Check). Thorough SFV Monitoring (defined as recording along a minimum of two radials with at least one radial containing three or more recorders) must be conducted for the first three foundations of a project, and when a foundation is to be installed with a substantially different set of values for key parameters including foundation type, pile size, installation method, hammer energy rating, water depth, seabed composition, and season. Further, if levels measured in any SFV (Thorough or Abbreviated) imply the exceedance of authorized ranges to regulatory thresholds (specified by either the RSLL or approvals documents), Thorough SFV Monitoring must be conducted until SFVs from three consecutive foundations demonstrate adherence to the authorized levels following a foundation that exceeds said limit. Further, the Lessee must comply with other Terms and Conditions directing action should SFV-measured ranges exceed those authorized. See Chapter 3 of BOEM's *Nationwide Recommendations for Impact Pile Driving Sound Exposure Modeling and Sound Field Measurement for Offshore Wind Construction and Operations Plans* for more information. **SFV Plan** The Lessee must submit an SFV Plan for review and written approval by BOEM and BSEE (TIMS), in consultation with NMFS and USACE (when applicable) 120 days before the planned commencement of field activities for pile-driving. The SFV Plan must be sufficient to assess sound propagation from the foundation and the distances to isopleths for potential injury and harassment as well as the RSLL, when applicable. The measurements must be compared to the modeled Level A and Level B harassment zones for marine mammals (and the injury and behavioral disturbance zones for sea turtles and Atlantic sturgeon), and the plan should include the target modeled sound levels that each monitored installation is expected to stay below. The SFV Plan should include approximations of the expected variation of the key parameters across the project and an estimate of how many Thorough SFV Monitoring locations will be required to cover this variation. The plan must describe how the Lessee will ensure that the locations selected for Thorough SFV Monitoring are representative of the rest of the foundations of that type to be installed.	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	

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		The plan must include an Abbreviated SFV check, where at minimum, a single recorder is placed, 2,460 feet (750 meters) from the installation of any foundation not requiring Thorough SFV Monitoring to ensure that inherent variability does not result in received levels above what was analyzed within the permitting/authorization/assessment/NEPA process or the RSLL, whichever is smaller. The plan must include measurement procedures and results reporting that meet ISO standard 18406:2017 (Underwater acoustics—Measurement of radiated underwater sound from percussive pile-driving). The plan must include an example reporting template for both Thorough SFV Monitoring and Abbreviated SFV Check. All comments on the SFV Plan must be addressed to BOEM/BSEE's satisfaction before any pile-driving activities can commence. A copy of the approved SFV Plan must be in the possession of and followed by any Lessee designees operating under the authority of the approved COP and carrying out the requirements on site. The submission of raw acoustic data or data products associated with SFV to BOEM may be required. **SFV Reporting** Thorough SFV Monitoring reports must be submitted to BOEM, BSEE (TIMS), NMFS, and USACE (when applicable) within 48 hours of completion of foundation installation. Abbreviated SFV Check reports must also be submitted to BOEM, BSEE (TIMS), NMFS, and USACE (when applicable) but may be submitted in weekly batch reports as long as Abbreviated SFV Check measurements are in compliance with all applicable regulatory thresholds (RSLL, and/or harassment, injury and behavior thresholds). Reports must include modeled and measured distances to isopleths for potential injury and harassment to marine mammals, sea turtles, and sturgeon. The Lessee is referred to the BOEM Nationwide Recommendations for Impact Pile-Driving Sound Exposure Modeling and Sound Field Measurement for Offshore Wind Construction and Operations Plans for other recommendations on what should be contained in the report.			
MUL-30	Strike avoidance and shutdown zones during geophysical surveys	Vessel operators and crews must maintain a vigilant watch for all marine protected species and slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any ESA-listed species. The presence of a single species at the surface may indicate the presence of submerged animals in the vicinity; therefore, precautionary measures should always be exercised. A visual observer aboard the vessel must monitor a vessel strike-avoidance zone (species-specific distances detailed below) around the vessel according to the parameters stated below, to ensure the potential for strike is minimized. Minimum separation distances for ESA-listed sea turtles must be monitored at all times and be demarcated within the monitoring zone with effective distance finding methods (e.g., reticle binoculars, range finding sticks, monitoring system software). A 1,640-foot (500-meter) monitoring zone will be established in every direction around each survey vessel. All threatened and endangered species within this distance will be monitored by third-party PSOs and survey operations and listed species data recorded. If a sea turtle is sighted within 328 feet (100 meters) or less of the operating vessel's forward path, the vessel operator must slow down to 4 knots (7.4 kilometers per hour) (unless unsafe to do so) and then proceed away from the turtle at a speed of 4 knots (7.4 kilometers per hour) or less until there is a separation distance of at least 328 feet (100 meters) at which time the vessel may resume normal operations. If a sea turtle is sighted within 164 feet (50 meters) of the forward path of the operating vessel, the vessel operator must shift to neutral when safe to do so and then proceed away from the turtle at a speed of 4 knots (7.4 kilometers per hour). The vessel may resume normal operations once it has passed the turtle. Visual observers monitoring the vessel strike-avoidance zone can be either third-party PSOs or trained lookouts (dedicated vessel crew), but trained lookouts responsible for these duties must be provided sufficient training to distinguish ESA-listed species to broad taxonomic groups and have no other responsibilities during the time of observation. If the shutdown zones cannot be adequately monitored for animal presence (i.e., a PSO determines conditions are such that ESA-listed species cannot be reliably sighted within the shutdown zones), the survey must be stopped until such time that the shutdown zones can be reliably monitored. This monitoring must be carried out by NMFS-approved PSOs or trained lookouts.	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	✓
MUL-31	Sampling gear removal between seasons	All fisheries sampling gear must be hauled at least once every 30 days, and all gear must be removed from the water and stored on land between survey seasons to minimize risk of entanglement.	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM and BSEE	✓
MUL-32	Daily, weekly, and final PSO reporting requirements (including foundation pile-driving)	PSOs must be previously approved by NMFS to conduct mitigation and monitoring duties for pile-driving activity. An adequate number of PSOs must be used to effectively monitor the area of the clearance and shutdown zones. Data fields must be reported in an electronic CSV format as daily reports during shutdowns and weekly reports during pile-driving and construction. Data categories must include Project, Operations, Monitoring Effort, and Detection. Data must be generated through software applications or otherwise recorded electronically by PSOs. Applications developed to record PSO data are encouraged as long as the data fields listed below can be recorded and exported to Excel. Alternatively, BOEM has developed an Excel spreadsheet with all the necessary data fields that is available upon request from BOEM.	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	✓

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		The third-party PSO providers must submit the daily (if applicable) and weekly monitoring reports to BOEM (renewable_reporting@boem.gov), NMFS (incidental.take@noaa.gov), and BSEE (submittals via TIMSWeb and notification email to protectedspecies@bsee.gov) every Wednesday during construction for the previous week (Sunday through Saturday) of monitoring of pile-driving activity. Daily PSO forms, including electronic effort, survey, and sightings forms, must be submitted to BOEM (renewable_reporting@boem.gov) monthly on the 15th day of each month for the previous calendar month of activities. Required data and reports may be archived, analyzed, published, and disseminated by BOEM. The following should be included in PSO reports: • Detection Information for Protected Species: o Date (YYYY-MM-DD) o Sighting ID (V01, V02 or sequential sighting number for that day) (multiple sightings of same animal or group should use the same ID) o Date and time at first detection in UTC (YY-MM-DDT HH:MM) o Time at last detection in UTC (YY-MM-DDT HH:MM) o PSO name(s) (Last, First) o Effort (On = source on; Off = source off) o Latitude (decimal degrees dd.ddddd), Longitude (decimal degrees dd.ddddd) o Compass heading of vessel (degrees) o Water depth (meters) o Swell height (meters) o Beaufort scale o Precipitation o Visibility (km) o Cloud coverage (%) o Glare o Sightings, including common name, scientific name, or family o Certainty of identification o Number of adults o Number of juveniles o Total number of animals o Bearing to animal(s) when first detected (ship heading + clock face) o Range from vessel (reticle distance in meters) o Description (include features such as overall size; shape of head; color and pattern; size, shape, and position of dorsal fin; height, direction, and shape of blow) o Detection narrative (note behavior, especially changes in relation to survey activity and distance from source vessel) o Direction of travel/first approach (relative to vessel) o Behaviors observed: Indicate behaviors and behavioral changes observed in sequential order (use behavioral codes) o If any bow-riding behavior observed, record total duration during detection (HH:MM) o Initial heading of animal(s) (degrees) o Final heading of animal(s) (degrees) o Source activity at initial detection o Source activity at final detection (on or off) o Shutdown zone size during detection (meters) o Was the animal inside the shutdown zone? o Closest distance to vessel (reticle distance in meters) o Time at closest approach (UTC HH:MM) o Time animal entered shutdown zone (UTC HH:MM) o Time animal left shutdown zone (UTC HH:MM)			

Measure ID[1]	Measure Name	Description	Resource Area Mitigated	Anticipated Enforcing Agency	Previously Applied as a COP Term and Condition
		○ If observed/detected during ramp up / power up: First distance (reticle distance in meters), Closest distance (reticle distance in meters), Last distance (reticle distance in meters), Behavior at final detection ○ Shutdown or power-down occurrences ○ Detections with PAM • Monitoring Effort Information for Pile-Driving: ○ Date ○ Effort (On = source on; Off = source off) ○ If visual, how many PSOs on watch at one time? ○ PSOs (Last, First) ○ Start time of observations ○ End time of observations ○ Duration of visual observation ○ Wind speed (knots), from direction ○ Beaufort scale ○ Swell (meters) ○ Water depth (meters) ○ Visibility (km) ○ Glare severity ○ Block name and number ○ Location: latitude and longitude The daily report during shutdown (if applicable) must include the date, time, species, pile identification number, GPS coordinates, time and distance of the animal when sighted, time the shutdown or power-down occurred, behavior of the animal, direction of travel, time the animal left the shutdown zone, time the pile-driver was restarted or powered back up, any photographs that may have been taken, number of animals, closest approach of animal to pile-driving, distance of animal to pile-driving when shutdown was initially requested, and total time animal spent in the shutdown zone. Weekly reports can consist of raw data. Required data and reports provided to BOEM and BSEE may be archived, analyzed, published, and disseminated by BOEM. PSO data must be reported weekly every Wednesday during construction for the previous week (Sunday through Saturday) from the start of visual and/or PAM efforts during pile-driving activities, and every week thereafter until the final reporting period upon conclusion of pile-driving activity. Any editing, review, and quality assurance checks must be completed only by the PSO provider prior to submission to NMFS, BOEM, and BSEE. The Lessee must submit—to BOEM and BSEE at renewable_reporting@boem.gov for BOEM and via TIMSWeb and notification email to protectedspecies@bsee.gov for BSEE—a final summary report of PSO monitoring 90 days following the completion of pile-driving. The following required data fields for the final PSO report should include: • Project Information: ○ Project name ○ Lease number ○ State coastal zones ○ PSO contractor(s) ○ Vessel name(s) ○ Reporting date(s) ○ Visual monitoring equipment used (e.g., bionics, magnification, IR cameras, etc.) ○ Distance finding method used ○ PSO names (last, first) and training ○ Observation height above sea surface • Operations Information: ○ Date (YYYY-MM-DD) ○ Hammer type used (make and model) ○ Greatest hammer power used for each pile			

Measure ID[1]	Measure Name	Description	Resource Area Mitigated	Anticipated Enforcing Agency	Previously Applied as a COP Term and Condition
		○ Pile identifier and pile number for the day (e.g., pile 2 of 3 for the day) ○ Pile diameters ○ Pile length ○ Pile locations (latitude and longitude) • Monitoring Effort Information: ○ Date (YYYY-MM-DD) ○ Noise source (On = hammer on; Off = hammer off) ○ PSO name(s) (Last, First) ○ If visual, how many PSOs on watch at one time? ○ Time pre-clearance visual monitoring began in UTC (HH:MM) ○ Time pre-clearance monitoring ended in UTC (HH:MM) ○ Time pre-clearance PAM monitoring began in UTC (HH:MM) ○ Time PAM monitoring ended in UTC (HH:MM) ○ Duration of pre-clearance visual and PAM monitoring ○ Time power up/ramp up began ○ Time equipment full power was reached ○ Duration of power up/ramp up ○ Time pile-driving began (hammer on) ○ Time pile-driving activity ended (hammer off) ○ Duration of activity ○ Duration of visual observation ○ Wind speed (knots), from direction ○ Swell height (meters) ○ Water depth (meters) ○ Visibility (km) ○ Glare severity ○ Latitude (decimal degrees), longitude (decimal degrees) ○ Compass heading of vessel (degrees) ○ Beaufort scale ○ Precipitation ○ Cloud coverage (%) ○ Did a shutdown/power-down occur? ○ Time shutdown was called for (UTC) ○ Time equipment was shut down (UTC) ○ Record any habitat or prey observations ○ Record any marine debris sighted • Detection Information: ○ Date (YYYY-MM-DD) ○ Sighting ID (V01, V02, or sequential sighting number for that day) (multiple sightings of same animal or group uses the same ID) ○ Date and time at first detection in UTC (YY-MM-DDT HH:MM) ○ Time at last detection in UTC (YY-MM-DDT HH:MM) ○ PSO name(s) (Last, First) ○ Effort (On = hammer on; Off = hammer off) ○ If visual, how many PSOs on watch at one time? ○ Start time of observations ○ End time of observations ○ Duration of visual observation			

Measure ID[1]	Measure Name	Description	Resource Area Mitigated	Anticipated Enforcing Agency	Previously Applied as a COP Term and Condition
		○ Wind speed (knots), from direction ○ Swell height (meters) ○ Water depth (meters) ○ Visibility (km) ○ Glare severity ○ Latitude (decimal degrees), longitude (decimal degrees) ○ Compass heading of vessel (degrees) ○ Beaufort scale ○ Precipitation ○ Cloud coverage (%) ○ Sightings including common name, scientific name, or family ○ Certainty of identification ○ Number of adults ○ Number of juveniles ○ Total number of animals ○ Bearing to animal(s) when first detected (ship heading + clock face) ○ Range from vessel (reticle distance in meters) ○ Description (include features such as overall size; shape of head; color and pattern; size, shape, and position of dorsal fin; height, direction, and shape of blow, etc.) ○ Detection narrative (note behavior, especially changes in relation to survey activity and distance from source vessel) ○ Direction of travel/first approach (relative to vessel) ○ Behaviors observed: indicate behaviors and behavioral changes observed in sequential order (use behavioral codes) ○ If any bow-riding behavior observed, record total duration during detection (HH:MM) ○ Initial heading of animal(s) (degrees) Final heading of animal(s) (degrees) ○ Shutdown zone size during detection (meters) ○ Was the animal inside the shutdown zone? ○ Closest point of approach to pile-driving operation (reticle distance in meters) ○ Time at closest approach (UTC HH:MM) ○ Time animal entered shut-down zone (UTC HH:MM) ○ Time animal left shut-down zone (UTC HH:MM) ○ If observed/detected during ramp up/power up: first distance (reticle distance in meters), closest distance (reticle distance in meters), last distance (reticle distance in meters), behavior at final detection ○ Did a shutdown/power-down occur? ○ Time shutdown was called for (UTC) ○ Time equipment was shut down (UTC) ○ Reason shutdown was not implemented			
MUL-33	Vessel communication of threatened and endangered species sightings	Whenever multiple vessels are operating for an individual project, any visual observations of listed species (marine mammals and sea turtles) must be communicated immediately to a PSO and/or vessel captain(s) associated with the other project vessel(s).	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	✓
MUL-34	Detected or impacted protected species reporting	The Lessee must report within 48 hours all observations or collections of injured or dead whales, sea turtles, or sturgeon to BSEE and NMFS. The Lessee must ensure its reports reference the project and include the Take Report Form available on NMFS' webpage at: https://media.fisheries.noaa.gov/202107/Take%20Report%20Form%2007162021.pdf?null. The Lessee must ensure reports of Atlantic sturgeon take include a statement as to whether a fin clip sample for genetic sampling was taken. Fin clip samples are required in all cases with the only exception being when additional handling of the sturgeon may result in an imminent risk of injury to the fish or the PSO. Incidents falling within the exception are expected to be limited to capture and handling of sturgeon in extreme weather. Instructions for fin clips and associated metadata are available at https://www.fisheries.noaa.gov/new-england-midatlantic/consultations/section-7-take-reporting-programmatics-greater-atlantic under the "Sturgeon Genetics Sampling" heading.	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	✓

Measure ID[1]	Measure Name	Description	Resource Area Mitigated	Anticipated Enforcing Agency	Previously Applied as a COP Term and Condition
		The Lessee must report any suspected or confirmed vessel strike of a sea turtle or sturgeon by any project vessel in any location, including observation of any injured sea turtle/sturgeon or sea turtle/sturgeon parts to BOEM, BSEE, NMFS, and NMFS New England/Mid-Atlantic Regional Stranding Hotline (866-755-6622) as soon as feasible. The Lessee must include in the report the following information: (a) time, date, and location (latitude/longitude) of the incident; (b) species identification (if known) or description of the animal(s) involved; (c) vessel's speed during and leading up to the incident; (d) vessel's course/heading and what operations were being conducted (if applicable); (e) status of all sound sources in use; (f) description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken, if any, to avoid strike; (g) environmental conditions (e.g., wind speed and direction, Beaufort scale, cloud cover, visibility) immediately preceding the strike; (h) estimated size and length of animal that was struck; (i) description of the behavior of the animal immediately preceding and following the strike; (j) estimated fate of the animal (e.g., dead, injured but alive, injured and moving, blood or tissue observed in the water, status unknown, disappeared); and (k) to the extent practicable, photographs or video footage of the animal(s). In the event that an injured or dead marine mammal or sea turtle is sighted, the Lessee must report the incident to BOEM, BSEE, NMFS, NMFS New England/Mid-Atlantic Regional Stranding Hotline (866-755-6622), as soon as feasible, but no later than 24 hours from the sighting. The Lessee must include in the report the following information: (a) time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable); (b) species identification (if known) or description of the animal(s) involved; (c) condition of the animal(s) (including carcass condition if the animal is dead); (d) observed behaviors of the animal(s), if alive; (e) if available, photographs or video footage of the animal(s); and (f) general circumstances under which the animal was discovered. The Lessee must follow any instructions provided by staff responding to the hotline call for handling or disposing of any injured or dead animals, which may include coordination of transport to shore, particularly for injured sea turtles.			
MUL-35	Monthly/annual reporting requirements	**Monthly**: The Lessee must compile and submit monthly reports that include a summary of all project activities carried out in the previous month, including trawl surveys, vessel transits (number, type of vessel, and route inclusive of port of origin and destination), and piles installed, and all observations of ESA-listed whales, sea turtles, and sturgeon. These reports related to ESA and non-ESA listed marine species reporting conditions must be submitted to BOEM, BSEE, and NMFS no later than the 15th of the month for the previous month. **Annual**: Beginning one calendar year after the completion of commissioning activities, the Lessee must compile and submit annual reports that include a summary of all project activities carried out in the previous year, including vessel transits (number, type of vessel, ports used, and route), repair and maintenance activities, survey activity, and all observations of ESA-listed species. The annual reports must be submitted to BOEM, BSEE, and NMFS. The Lessee must submit these reports by April 1 of each year for the previous calendar year (i.e., the 2026 report is due by April 1, 2027). Upon mutual agreement of NMFS, BOEM, and BSEE, the frequency of reports can be changed.	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	✓
MUL-36	Visual vessel strike monitoring	Lessees must require visual vessel strike monitoring of protected species for all vessels while operating within US EEZ waters. This includes vessels traveling from Europe or other regions, in which visual monitoring is conducted for vessel strike avoidance when the vessel is within the US EEZ boundary. This can include the use of trained observers onboard the vessel, or alternative monitoring, such as IR camera systems, with the possibility of remote monitoring for systems with established and documented efficacy.	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	
MUL-37	Aircraft Detection Lighting System (ADLS)	Lessees must use an FAA-approved vendor for the ADLS, which will activate the FAA hazard lighting only when an aircraft is in the vicinity of the wind facility to reduce visual impacts at night. Lessees must confirm the use of an FAA-approved vendor for ADLS on WTGs and OSSs in the FIR.	Birds; Cultural Resources; Marine Mammals; Recreation and Tourism; Sea Turtles; Scenic and Visual Resources	BOEM, BSEE, and FAA	✓
MUL-38	Noise mitigation plan	Lessees must create a noise mitigation plan to reduce project noise that could potentially constitute a take, as defined in the ESA or the MMPA, of an endangered or threatened species or marine mammal. The intent of the noise mitigation plan is to ensure Lessees thoroughly assess and minimize potential impactful noise to the maximum extent practicable, and that any government-established noise reduction targets (e.g., MUL-22) are met. The noise mitigation plan may be submitted through the Lessee's initial COP submission or subsequent updated versions but must be finalized prior to initiating construction activities. BOEM and BSEE will review the plan for sufficiency and acceptability. Any outstanding comments must be addressed by the Lessee before the plan is considered final. At a minimum, the noise mitigation plan must include: (1) baseline sound characterization (predicted or measured) of their project area; (2) the types, duration, and levels of unmitigated noise the project will produce; (3) identification of any applicable government-established noise reduction targets; and (4) the operational measures, noise abatement technologies, and contingency plans (in the case of foreseeable issues) or similar that will be used to meet any existing established noise reduction targets or reduce the overall	Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM, BSEE, and NMFS	

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		impact of any noise introduced into the marine environment. On a case-by-case basis, BOEM may consider accepting a plan that does not meet established noise reduction targets or, where such targets do not exist, does not demonstrate reduction of impactful noise to the maximum extent practicable if the plan includes sufficient justification for why this is not possible. In these cases, a requirement for compensatory mitigation may be considered.			
MUL-39	Electrical shielding on underwater cables	Lessees should use standard underwater cables that have electrical shielding to control the intensity of electromagnetic fields (EMF). EMF will be further refined as part of the design or cable burial risk assessment.	Benthic; Finfish, Invertebrates, and EFH; Marine Mammals; Sea Turtles	BOEM and BSEE	
NAV-1	Boulder relocation reporting	The Lessee must provide USCG, NOAA, navigational software companies, and the local harbormaster with a comprehensive list and shapefile of positions and areas to which boulders >6.6 feet (>2 meters) will be relocated (latitude, longitude) at least 60 days prior to boulder relocation activities.	Commercial and For-Hire Fishing, Navigation and Vessel Traffic	BOEM, BSEE, USCG, and NOAA	
NAV-2	Marine Planning Guidelines	In developing their initial COP or as part of subsequent updated versions, Lessees will adopt the Marine Planning Guidelines (NVIC 02-23, Enclosure (3) or applicable current version: https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5p/5ps/NVIC/2020/2023/OREI%20NVIC%202023_FINAL_05OCT2023.pdf?ver=2FtgA6VSQw3TzFDIObhmgQ%3d%3d, where applicable, as established by USCG to ensure navigational safety. Additionally, Lessees will work closely with USCG and USCG-recognized maritime experts to improve procedures for evaluating and regulating safety at sea, including through adjustments to the Port Access Route Study process.	Navigation and Vessel Traffic	BOEM, BSEE, and USCG	
NAV-3	Cable placement for navigation and safety	Lessees must seek to avoid unfavorable cable placement, including avoidance of Federal Aids to Navigation (ATONs), Private Aids to Navigation (PATONs), anchorage areas (including Ambrose Anchorage), Traffic Separation Schemes, and Fairways. If these cannot be avoided, the Lessees will coordinate with USCG and make best efforts to route the cable as directly across these routing schemes as reasonably practicable. Cables that need to cross the proposed New York to New Jersey Connector Fairway tug-and-tow lane should cross as perpendicularly to the lane as feasible.	Navigation and Vessel Traffic	BOEM, BSEE, and USCG	

OU-1	Mitigation for oceanographic high frequency radars	BOEM would require that the Lessee coordinate with the radar operators and the Surface Currents Program of NOAA Integrated Ocean Observing System (IOOS) Office to assess if the project causes radar interference to the degree that radar performance is no longer within the specified radar system's operation parameters or fails to meet mission objectives. If either is the case, the Lessee must notify BOEM and engage radar operators and NOAA IOOS on mitigation efforts. The following options to mitigate operational impacts on oceanographic high-frequency radars have been identified:
		• Data sharing from turbine operators to include the following:
		  ○ Sharing real-time telemetry of surface currents and other oceanographic data measured at locations in the project with radar operators into the public domain.
		  ○ Sharing time-series of blade rotation rates, nacelle bearing angles, and other information about the operational state of each of the project's turbines with radar operators to aid interference mitigation.
		• Wind farm curtailment/curtailment agreement between NOAA IOOS, Lessee and BOEM
		Additional modifications identified for oceanographic high-frequency radar systems to mitigate impacts:
		• Signal processing enhancements.
		• Antenna modifications
			Other Uses	BOEM and BSEE	

OU-2	Mitigation for NEXRAD weather radar systems	Operational mitigations to NEXRAD weather radar systems include the following: • Wind farm curtailment/curtailment agreement Research is being conducted to determine whether impacts on weather radar can be mitigated by using phased array radars to achieve a null in the antenna radiation pattern in the direction of the wind turbine.	Other Uses	BOEM and BSEE	
OU-3	Mitigation for ARSR-4 and ASR-8/9 radars	Operational mitigations identified for impacts on airport surveillance radar (ASR)-8/9: • Passive aircraft tracking using ADS-B or signal/transponder • Increased aircraft altitude near radar • Sensitivity time control (range-dependent attenuation) • Range azimuth gating (ability to isolate/ignore signals from specific range-angle gates) • Track initiation inhibiting, velocity editing, plot amplitude thresholding (limiting the amplitude of certain signals) Modification mitigations for ARSR-4 and for ASR-8/9 systems:	Other Uses	BOEM and BSEE	

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		• Utilizing the dual beams of the radar simultaneously • In-fill radars			
OU-4	Decommissioning in marine minerals resource areas	Infrastructure emplaced in marine minerals resource areas must be removed from the marine mineral resource area during decommissioning. In addition, any request to decommission in place in such areas through a departure request must demonstrate no significant impacts to marine minerals resources.	Other Uses	BOEM and BSEE	
OU-5	HF radar interference mitigation agreement	At least 60 calendar days prior to completion of construction or initiation of commercial operations (whichever is earlier), the Lessee must enter into a mitigation agreement with the Surface Currents Program of NOAA's Integrated Ocean Observing System (IOOS) Office to determine if the Lessee's project causes radar interference to the degree that radar performance is no longer within the specific radar systems' operational parameters or fails to meet NOAA IOOS's mission objectives and to establish a mitigation agreement. Within 15 calendar days of entering into the mitigation agreement, the Lessee must provide BOEM with a copy of the executed mitigation agreement. Within 45 calendar days of completing any requirements in the mitigation agreement, the Lessee must provide BOEM and BSEE with evidence of compliance with those requirements. Where possible, the Lessee will adhere to the recommendations for mitigation to marine radar interference from the National Academy of Science: *Wind Turbine Generator Impacts to Marine Vessel Radar* (2022).	Other Uses	BOEM, BSEE, and NMFS	
OU-6	Marine minerals resource area avoidance	Lessees must coordinate with the BOEM Marine Minerals Program (MMP), USACE, and state resource agencies (e.g., NJDEP, NYSDEC, NYSDOS) on cable corridor placement with any preliminary design or design changes and prior to final cable placement. Lessees must ensure that bottom-disturbing activities avoid, to the maximum extent practicable, nearshore borrow areas and OCS sediment resources. Any activity that lasts more than 180 days and is located within 500 lateral meters of any marine minerals resource areas or limits the long-term use of the resource is considered bottom disturbing. Lessees must use their geophysical and geological information collected in/along proposed corridors to demonstrate and verify the existence of sand resource or dearth of sand resource and estimate (via range) the possible implication of cable crossing on volume access. The Lessee is responsible for responding to any request from these agencies in writing and to show good faith efforts to avoid sand resources to the maximum extent practicable or explain why another alternative is not technically or economically feasible.	Other Uses	BOEM and BSEE	
OU-7	Federal Survey Mitigation Program	There are NMFS scientific surveys that overlap with wind energy development in the northeast region. Consistent with NMFS and BOEM survey mitigation strategy actions 1.3.1, 1.3.2, 2.1.1, and 2.1.2 in the NOAA Fisheries and BOEM Federal Survey Mitigation Implementation Strategy – Northeast US Region (Hare et al. 2022)[7] within 120 days of COP approval, the Lessee must submit to BOEM a survey mitigation agreement between NMFS and the Lessee. The survey mitigation agreement must describe how the Lessee will mitigate the project impacts on the NMFS surveys. The Lessee must conduct activities in accordance with such agreement. If the Lessee and NMFS fail to reach a survey mitigation agreement, then the Lessee must submit a survey mitigation plan to BOEM and NMFS that is consistent with the procedures described below, within 180 days of COP approval. BOEM will review the survey mitigation plan in consultation with NMFS Northeast Fisheries Science Center (NEFSC), and the Lessee must resolve comments to BOEM's satisfaction and must conduct activities in accordance with the plan. • As soon as reasonably practicable, but no later than 30 days after the issuance of the project's COP approval, the Lessee must initiate coordination with NMFS NEFSC to develop the survey mitigation agreement described above. Mitigation activities specified under the agreement must be designed to mitigate the project impacts on the NMFS NEFSC surveys that overlap with the project. At a minimum, the survey mitigation agreement must describe actions and the means to address impacts on the affected surveys due to the preclusion of sampling platforms and impacts on statistical designs. NMFS has determined that the project area is a discrete stratum for surveys that use a random stratified design. This agreement may also consider other anticipated project impacts on NMFS surveys, such as changes in habitat and increased operational costs due to loss of sampling efficiencies. • The survey mitigation agreement must identify activities that will result in the generation of data equivalent to data generated by NMFS' affected surveys for the duration of the project. The survey mitigation agreement must describe the implementation procedures by which the Lessee will work with NEFSC to generate, share, and manage the data required by NEFSC for each of the surveys impacted by the project, as mutually agreed upon between the Lessee and NMFS/NEFSC. The survey mitigation agreement must also describe the Lessee's participation in the NMFS NEFSC Northeast Survey Mitigation Program to support activities that address regional-level impacts for the surveys.	Other Uses	BOEM and NMFS	✓

[7] Hare, J.A., Blythe, B.J., Ford, K.H., Godfrey-McKee, S., Hooker, B.R., Jensen, B.M., Lipsky, A., Nachman, C., Pfeiffer, L., Rasser, M. and Renshaw, K., 2022. NOAA Fisheries and BOEM Federal Survey Mitigation Implementation Strategy - Northeast US Region. NOAA Technical Memorandum 292. Woods Hole, MA. 33 pp.

Measure ID[1]	Measure Name	Description	Resource Area Mitigated	Anticipated Enforcing Agency	Previously Applied as a COP Term and Condition
REC-1	Nearshore construction timing restriction	Lessees should prioritize scheduling of nearshore construction activities for outside the summer tourist season, which is generally between Memorial Day and Labor Day.	Land Use and Coastal Infrastructure, Recreation and Tourism	Voluntary	
ST-1	Monitoring zone for sea turtles for pile-driving	Lessees must monitor the full extent of the area where noise would exceed the 175 dB re 1 μPa received level behavioral threshold for sea turtles for the full duration of all pile-driving activities and for 30 minutes following the cessation of pile-driving activities. Lessees must record all observations to ensure that all take that occurs is documented (see MUL-32 and MUL-34).	Sea Turtles	BOEM, BSEE, and NMFS	
ST-2	Monitoring for sea turtles and reporting	Between June 1 and November 30, the Lessees must have a trained lookout posted on all vessel transits during all phases of the project to observe for sea turtles. The trained lookout must communicate any sightings, in real time, to the captain so that the requirements in (e) below can be implemented. a. The trained lookout must monitor https://seaturtlesightings.org/ prior to each trip and report any observations of sea turtles in the vicinity of the planned transit to all vessel operators/captains and lookouts on duty that day. b. The trained lookout must maintain a vigilant watch and monitor a Vessel Strike Avoidance Zone (1,640 feet [500 meters]) at all times to maintain minimum separation distances from ESA-listed species. Alternative monitoring technology (e.g., night vision, thermal cameras) will be available to ensure effective watch at night and in any other low visibility conditions. If the trained lookout is a vessel crew member, this must be their designated role and primary responsibility while the vessel is transiting. Any designated crew lookouts must receive training on protected species identification, vessel strike minimization procedures, how and when to communicate with the vessel captain, and reporting requirements. c. If a sea turtle is sighted within 328 feet (100 meters) or less of the operating vessel's forward path, the vessel operator must slow down to 4 knots (7.4 kilometers per hour) (unless unsafe to do so) and then proceed away from the turtle at a speed of 4 knots (7.4 kilometers per hour) or less until there is a separation distance of at least 328 feet (100 meters), at which time the vessel may resume normal operations. If a sea turtle is sighted within 164 feet (50 meters) of the forward path of the operating vessel, the vessel operator must shift to neutral when safe to do so and then proceed away from the turtle at a speed of 4 knots (7.4 kilometers per hour). The vessel may resume normal operations once it has passed the turtle. d. Vessel captains/operators must avoid transiting through areas of visible jellyfish aggregations or floating sargassum lines or mats. In the event that operational safety prevents avoidance of such areas, vessels will slow to 4 knots (7.4 kilometers per hour) while transiting through such areas. e. All vessel crew members must be briefed in the identification of sea turtles and in regulations and best practices for avoiding vessel collisions. Reference materials must be available aboard all project vessels for identification of sea turtles. The expectation and process for reporting of sea turtles (including live, entangled, and dead individuals) will be clearly communicated and posted in highly visible locations aboard all project vessels, so that there is an expectation for reporting to the designated vessel contact (such as the lookout or the vessel captain), as well as a communication channel and process for crew members to do so. f. The only exception is when the safety of the vessel or crew necessitates deviation from these requirements on an emergency basis. If any such incidents occur, they must be reported to NMFS and BSEE within 24 hours. If a vessel is carrying a PSO or trained lookout for the purposes of maintaining watch for NARWs, an additional lookout is not required and this PSO or trained lookout must maintain watch for whales and sea turtles.	Sea Turtles	BOEM, BSEE, and NMFS	✓
ST-3	Sea turtle disentanglement	Vessels deploying fixed gear (e.g., pots/traps) must have adequate disentanglement equipment (i.e., knife and boathook) onboard. Any disentanglement will occur consistent with the Northeast Atlantic Coast STDN Disentanglement Guidelines (https://www.reginfo.gov/public/do/DownloadDocument?objectID=102486501) and the procedures described in Careful Release Protocols for Sea Turtle Release with Minimal Injury (NOAA Technical Memorandum 580; https://repository.library.noaa.gov/view/noaa/3773).	Sea Turtles	BOEM, BSEE, and NMFS	✓
STF-1	Monitoring on strategically placed WTGs	Lessees are encouraged to incorporate technologies for detecting tagged (e.g., Innovasea) sea turtles and highly migratory fish in their project to monitor the effect of increases in habitat use and residency around WTG foundations. The Lessees are encouraged to share monitoring results and propose new or additional mitigation measures and/or monitoring methods if appropriate.	Finfish, Invertebrates, and EFH; Sea Turtles	Voluntary	
STF-2	Sea turtle/Atlantic sturgeon identification and data collection	Any sea turtles or Atlantic sturgeon caught and/or retrieved in any fisheries survey gear will first be identified to species or species group. Each ESA-listed species caught and/or retrieved must then be properly documented using appropriate equipment and data collection forms. Biological data, samples, and tagging must occur as outlined below. Live, uninjured animals must be returned to the water as quickly as possible after completing the required handling and documentation.	Finfish, Invertebrates, and EFH; Sea Turtles	BOEM, BSEE, and NMFS	✓

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		a. The Sturgeon and Sea Turtle Take Standard Operating Procedures will be followed (https://media.fisheries.noaa.gov/dammigration/sturgeon_&_sea_turtle_take_sops_external.pdf). b. Survey vessels must have a passive integrated transponder (PIT) tag reader onboard capable of reading 134.2 kHz and 125 kHz encrypted tags (e.g., Biomark GPR Plus Handheld PIT Tag Reader), and this reader will be used to scan any captured sea turtles and sturgeon for tags. Any recorded tags must be recorded on the take reporting form (see below). c. Genetic samples must be taken from all captured Atlantic sturgeon (alive or dead) to allow for identification of the distinct population segment (DPS) of origin of captured individuals and tracking of the amount of incidental take. This will be done in accordance with the Procedures for Obtaining Sturgeon Fin Clips (https://media.fisheries.noaa.gov/dammigration/sturgeon_genetics_ sampling_revised_june_2019.pdf). i. Fin clips will be sent to an NMFS-approved laboratory capable of performing genetic analysis and assignment to DPS of origin. To the extent authorized by law, BOEM is responsible for the cost of the genetic analysis. Arrangements would be made for shipping and analysis in advance of submission of any samples; these arrangements will be confirmed in writing to NMFS. Results of genetic analysis, including assigned DPS of origin, will be submitted to NMFS within 6 months of the sample collection. ii. Subsamples of all fin clips and accompanying metadata forms will be held and submitted to a tissue repository (e.g., the Atlantic Coast Sturgeon Tissue Research Repository) on a quarterly basis. The Sturgeon Genetic Sample Submission Form is available for download at: https://www.fisheries.noaa.gov/new-england-midatlantic/consultations/section-7-take-reporting-programmaticsgreater-atlantic. All captured sea turtles and Atlantic sturgeon must be documented with required measurements and photographs. The animal's condition and any marks or injuries will be described. This information will be entered as part of the record for each incidental take. An NMFS Take Report Form must be filled out for each individual sturgeon and sea turtle (download at: https://media.fisheries.noaa.gov/2021-1507/Take%20Report%20Form%2007162021.pdf) and submitted to NMFS.			
STF-3	Sea turtle/Atlantic sturgeon handling and resuscitation guidelines	Any sea turtles or Atlantic sturgeon caught and retrieved in gear used in fisheries surveys must be handled and resuscitated (if unresponsive) according to established protocols and whenever at-sea conditions are safe for those handling and resuscitating the animal(s) to do so. Specifically: a. Priority will be given to the handling and resuscitation of any sea turtles or sturgeon that are captured in the gear being used, if conditions at sea are safe to do so. Handling times for these species will be minimized (i.e., kept to 15 minutes or less) to limit the amount of stress placed on the animals. b. All survey vessels will have copies of the sea turtle handling and resuscitation requirements found at 50 CFR 223.206(d)(1) prior to the commencement of any on-water activity (download at: https://media.fisheries.noaa.gov/dammigration/sea_turtle_handling_and_resuscitation_measures.pdf). These handling and resuscitation procedures must be carried out any time a sea turtle is incidentally captured and brought onboard the vessel during the surveys. c. If any sea turtles that appear injured, sick, or distressed, are caught and retrieved in fisheries survey gear, survey staff must immediately contact the Greater Atlantic Region Marine Animal Hotline at 866-755-6622 for further instructions and guidance on handling the animal, and potential coordination of transfer to a rehabilitation facility. If unable to contact the hotline (e.g., due to distance from shore or lack of ability to communicate via phone), USCG must be contacted via VHF marine radio on Channel 16. If required, hard-shelled sea turtles (i.e., non-leatherbacks) may be held on board for up to 24 hours following handling instructions provided by the Hotline, prior to transfer to a rehabilitation facility. d. Attempts will be made to resuscitate any Atlantic sturgeon that are unresponsive or comatose by providing a running source of water over the gills as described in the Sturgeon Resuscitation Guidelines (https://media.fisheries.noaa.gov/dammigration-miss/Resuscitation-Cards-120513.pdf). e. Provided that appropriate cold storage facilities are available on the survey vessel, following the report of a dead sea turtle or sturgeon to NMFS, and if NMFS requests, any dead sea turtle or Atlantic sturgeon will be retained on board the survey vessel for transfer to an appropriately permitted partner or facility on shore as soon as it is safe to do so. Any live sea turtles or Atlantic sturgeon caught and retrieved in gear used in any fisheries survey must ultimately be released according to established protocols and whenever at-sea conditions are safe for those releasing the animal(s) to do so.	Finfish, Invertebrates, and EFH; Sea Turtles	BOEM, BSEE, and NMFS	✓
STF-4	Take notification for sea turtles/Atlantic sturgeon	NMFS must be notified as soon as possible of all observed takes of sea turtles and Atlantic sturgeon occurring because of any fisheries survey. Specifically:	Finfish, Invertebrates, and EFH; Sea Turtles	BOEM, BSEE, and NMFS	✓

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		• NMFS (nmfs.gar.incidental-take@noaa.gov) and BSEE (via TIMSWeb and protectedspecies@bsee.gov) will be notified within 24 hours of any interaction with a sea turtle or Atlantic sturgeon. The report must include at a minimum: (1) survey name and applicable information (e.g., vessel name, station number); (2) GPS coordinates describing the location of the interaction (in decimal degrees); (3) gear type involved (e.g., bottom trawl, gillnet, longline); (4) soak time, gear configuration, and any other pertinent gear information; (5) time and date of the interaction; and (6) identification of the animal to the species level. Additionally, the e-mail will transmit a copy of the NMFS Take Report Form (download at: https://media.fisheries.noaa.gov/2021-07/Take%20Report%20Form%2007162021.pdf) and a link to or acknowledgement that a clear photograph or video of the animal was taken (multiple photographs are suggested, including at least one photograph of the head scutes). If reporting within 24 hours is not possible due to distance from shore or lack of ability to communicate via phone, fax, or email, reports will be submitted as soon as possible; late reports will be submitted with an explanation for the delay. At the end of each survey season, a report must be sent to NMFS that compiles all information on any observations and interactions with ESA-listed species. This report will also contain information on all survey activities that took place during the season including location of gear set, duration of soak/trawl, and total effort. The report on survey activities will be comprehensive of all activities, regardless of whether ESA-listed species were observed.			
STF-5	Trailing suction hopper dredge mitigation	If a trailing suction hopper dredge is used offshore, operators must disengage dredge pumps when the dragheads are not actively dredging and therefore working to keep the draghead firmly on the bottom in order to prevent impingement or entrainment of ESA-listed fish and sea turtle species. Pumps must be disengaged when lowering dragheads to the bottom to start dredging, turning, or lifting dragheads off the bottom at the completion of dredging.	Finfish, Invertebrates, and EFH; Sea Turtles	BOEM and BSEE	
VIS-1	Onshore transmission tower visual contrast mitigation	Lessees should select a transmission tower type that has the least amount of visual contrast within the surrounding setting and the extended landscape within view of which the transmission line is routed through in order to avoid undue and unnecessary visual impact. Monopoles typically have less visual contrast within built environments, whereas lattice towers typically have less visual contrast in more natural settings. Lessees must color-treat the transmission tower darker grays (chemically treated galvanized finishes) to reduce visual contrast or powder-coat the tower with Bureau of Land Management Environmental Color Covert Green or Shadow Gray, or a BOEM-approved equal submitted by the Lessee for settings where Covert Green or Shadow Gray does not minimize the visual contrast. Lessees must prepare photo simulations of proposed onshore facilities with and without mitigation measures described in VIS-1. Bureau of Land Management color samples may be acquired by email to blm_oc_pmds@blm.gov.	Scenic and Visual Resources	As enforced under state permitting	
VIS-2	Onshore substation visual contrast mitigation	Lessees should color treat all substation facilities the same color, and color-treated to minimize visual contrast with the surrounding setting, and the extended landscape within view. The default color choice for substations must be Bureau of Land Management Environmental Color Covert Green or Shadow Gray, or a BOEM-approved equal submitted by the Lessee for settings where Covert Green or Shadow Gray does not minimize the visual contrast in order to avoid undue and unnecessary visual impact. Lessees must prepare photo simulations of proposed onshore facilities with and without mitigation measures described in VIS-2. Bureau of Land Management color samples may be acquired by email to blm_oc_pmds@blm.gov.	Scenic and Visual Resources	As enforced under state permitting	
VIS-3	Onshore overhead transmission conductors visual contrast mitigation	Lessees should use non-specular conductors for overhead transmission powerlines to avoid glare commonly associated with untreated conductors to avoid undue and unnecessary visual impact. Lessees must prepare photo simulations of proposed onshore facilities with and without mitigation measures described in VIS-3.	Scenic and Visual Resources	As enforced under state permitting	
VIS-4	Onshore overhead transmission line insulator visual contrast mitigation	Lessees should use polymer insulators to minimize glare commonly associated with glass insulators. Lessees should use polymer insulators that are a color that minimizes visual contrast with the surrounding setting and the extended landscape that is within view to avoid undue and unnecessary visual impact. The default color choice for polymer insulators substations should be Bureau of Land Management Environmental Color Covert Green or Shadow Gray, or Sudan Brown, or a BOEM-approved equal submitted by the Lessee for settings where Covert Green or Shadow Gray or Sudan Brown do not minimize the visual contrast. Bureau of Land Management color samples may be acquired by email to blm_oc_pmds@blm.gov. Lessees must prepare photo simulations of proposed onshore facilities with and without mitigation measures described in VIS-4.	Scenic and Visual Resources	As enforced under state permitting	
VIS-5	Onshore facility security fencing visual contrast mitigation	Lessees should ensure galvanized and other types of security fencing are treated to eliminate glare and color-treated to minimize visual contrast with the surrounding setting and the extended landscape that is within view to avoid undue and unnecessary visual impact. Methods include vinyl-coating, powder-coating, and oxidizing treatments. Colors must be dark brown, dark grays, or dark brown (oxidizing treatments only).	Scenic and Visual Resources	As enforced under state permitting	

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		Lessees must prepare photo simulations of proposed onshore facilities with and without mitigation measures described in VIS-5.			
VIS-6	Onshore facility lighting	In order to avoid undue and unnecessary visual impact, Lessees should ensure artificial light at night needed for nighttime operations and security at onshore facilities such as operational and maintenance facilities, substations, and others follows the night lighting principles to avoid light pollution and the artificial lighting best management practices outlined in the Bureau of Land Management Technical Note 457 available at https://www.blm.gov/sites/default/files/docs/2023-05/IB2023-038_att1.pdf. Lessees must prepare photo simulations of proposed onshore facilities with and without mitigation measures described in VIS-6.	Scenic and Visual Resources	As enforced under state permitting	
VIS-7	Monitoring impacts on scenic and visual resources	In coordination with BOEM, the Lessee must prepare and implement a scenic and visual resource monitoring plan that monitors and compares the visual effects of the wind farm during construction and operations/maintenance (daytime and nighttime) to the findings in the COP Visual Impact Assessment and verifies the accuracy of the visual simulations (photo and video). The monitoring plan must include monitoring and documenting the meteorological influences on actual wind turbine visibility over a duration of time from selected onshore key observation points, as determined by BOEM and the Lessee. In addition, the Lessee shall include monitoring the operation of ADLS in the monitoring plan. The Lessee must monitor the frequency that the ADLS is operative documenting when (dates and time) the aviation warning lights are in the on position and the duration of each event. Details for monitoring and reporting procedures must be included in the plan.	Scenic and Visual Resources	As enforced under state permitting	
WQ-1	Avoid zinc anodes	To the extent it is technically and/or economically practicable or feasible, the Lessee must avoid using zinc sacrificial anodes on external components of WTG and OSS foundations to reduce the release of metal contaminants in the water column.	Water Quality	BOEM and BSEE	✓
WQ-2	Oil Spill Response Plan	Pursuant to 30 CFR 585.627(c), the Lessee must submit an Oil Spill Response Plan (OSRP) to the BSEE Oil Spill Preparedness Division (OSPD) at BSEEOSPD_ATL_OSRPs@bsee.gov for review and approval prior to the installation of any component that may handle or store oil on the OCS. The OSRP may be lease-specific, or it may be a regional OSRP covering multiple leases. Facilities and leases covered in a regional OSRP must have the same owner or operator (including affiliates) and must be located in the Atlantic OCS region. For a regional OSRP, subject to BSEE OSPD approval, the Lessee may group leases into sub-regions for the purposes of determining worst-case discharge (WCD) scenarios, conducting stochastic trajectory analyses, and identifying response resources. The Lessee's OSRP must be consistent with the National Contingency Plan, Regional Contingency Plan, and the appropriate Area Contingency Plan(s), as defined in 30 CFR 254.6. To continue operating, the Lessee must operate consistent with the OSRP approved by BSEE. The Lessee's OSRP, including any regional OSRP, must contain the following information: 1. Bookmarks. Appropriately labeled bookmarks that are linked to their corresponding sections of the OSRP. 2. Table of Contents. 3. Record of Change. A table identifying the changes made to the current version of the OSRP and, as applicable, a record of changes made to previously submitted versions of the OSRP. 4. Facility and Oil Information. "Facility," as defined in 30 CFR 585.113, means an installation that is permanently or temporarily attached to the seabed of the OCS. An OSS and WTG, as examples, each meet this definition of facility. "Oil," as defined in 33 U.S.C. 1321(a), means oils of any kind or in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil. Dielectric fluid, as an example, meets this definition of oil. The OSRP must: a. List the latitude and longitude, water depth, and distance to the nearest shoreline for each facility that may handle and/or store oil. b. List the oil(s) by product/brand name and corresponding volume(s) on each type of facility covered under the Lessee's OSRP. c. Include a map depicting the location of each facility that may handle and/or store oil within the boundaries of the covered lease area(s) and their proximity to the nearest shoreline. The map must also feature a compass rose, scale, and legend. 5. Safety Data Sheets. The OSRP must include a safety data sheet for every type of oil present on any OCS facility in quantities equal to or greater than 100 gallons. 6. Response Organization. The OSRP must identify a trained Qualified Individual (QI), and at least one alternate, with full authority to implement removal actions and ensure immediate notification of appropriate federal officials and response personnel. The Lessee must designate personnel to serve as trained members of an Incident Management Team (IMT) and identify them by name and Incident Command System (ICS) position in the OSRP. a. "Qualified Individual" (QI) means an English-speaking representative of the Lessee who is located in the United States, available on a 24-hour basis, and given full authority to obligate funds, carry out removal actions, and communicate with the appropriate federal officials and the persons providing personnel and equipment in removal operations.	Water Quality	BOEM and BSEE	✓

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		b. "Incident Management Team" (IMT) means the group of personnel identified within the Lessee's organizational structure who manage the overall response to an incident in accordance with the Lessee's OSRP. The IMT consists of the Incident Commander (IC), Command and General Staff, and other personnel assigned to key ICS positions designated in the Lessee's OSRP. With respect to the IMT, the Lessee must identify at least one alternate in the OSRP for the IC, Planning Section Chief (PSC), Operations Section Chief (OSC), Logistics Section Chief (LSC), and Finance Section Chief (FSC). If a contract has been established with a third-party IMT, the Lessee must provide evidence of such a contract in the Lessee's OSRP. 7. Notification Procedures. The OSRP must describe the procedures for spill notification. Notification procedures must include the 24-hour contact information for: a. The QI and an alternate, including phone numbers and email addresses. b. IMT members, including phone numbers and email addresses. c. Federal, state, and local regulatory agencies that must be notified when a spill occurs, including, but not limited to, the National Response Center. d. The Oil Spill Removal Organizations (OSRO) and Spill Response Operating Teams (SROT) that are available to respond. e. Other response organizations and subject matter experts that the Lessee will rely on for the Lessee's response. 8. Spill Mitigation Procedures. The OSRP must describe the different discharge scenarios that could occur from the Lessee's facilities and the mitigation procedures by which the offshore facility operator and any listed/contracted OSROs would follow when responding to such discharges. The mitigation procedures must address responding to both smaller spills (with slow, low-volume leakage) and larger spills, to include the largest WCD scenario covered under the Lessee's OSRP. To achieve compliance with this section, the OSRP must include the following: a. Procedures for the early detection of a spill (i.e., monitoring procedures for detecting dielectric fluid and other oil-based substances handled or stored on the facility when spilled to the ocean). b. General procedures for ensuring that the source of a discharge is controlled as soon as possible after a spill occurs. c. Procedures to remove oil and oiled debris from shallow waters and along shorelines. d. Procedures to store, transfer, and dispose of recovered oil and oil-contaminated materials and to ensure that all disposal is consistent with federal, state, and local requirements. 9. Resources at Risk. The OSRP must include a concise list of the sensitive resources that could be impacted by a spill. In lieu of listing sensitive resources, the Lessee may identify the areas that could be impacted by a spill from the Lessee's facility and provide hyperlinks to corresponding Environmentally Sensitive Index Maps and Geographic Response Strategies/Plans for those areas from the appropriate Area Contingency Plan(s). 10. OSRO(s) and SROT(s). The OSRO is an entity contracted by the Lessee to provide spill response equipment and/or manpower in the event of an oil spill. The SROT is the trained persons who deploy and operate oil spill response equipment in the event of a spill, threat of a spill, or an exercise. The OSRP must include a list (with contact information) of the OSRO(s) and SROT(s) who are under contract and/or membership agreement to respond to the WCD of oil from the Lessee's offshore facilities. Evidence of such contracts or membership agreements must be provided in the OSRP. 11. Oil Spill Response Equipment. The OSRP must include a list, or a hyperlink to a list, of the oil spill response equipment that is available to the Lessee through a contract and/or membership agreement with the OSRO(s). The OSRP must include a map that shows the oil spill response equipment storage depot(s) and planned/potential staging area(s) for the oil spill response equipment that would be deployed by the facility operators or the OSRO(s) listed in the plan in the event of a discharge. a. The Lessee must ensure that the oil spill response equipment is maintained in proper operating condition. b. The Lessee must ensure that all oil spill response equipment maintenance, modification, and repair records are kept for a minimum of 3 years. c. The Lessee must provide oil spill response equipment maintenance, modification, and repair records to BSEE OSPD upon request. d. The Lessee or the OSRO must provide BSEE OSPD with physical access to the oil spill equipment storage depots and perform functional testing of the equipment upon request. e. BSEE OSPD may require maintenance, modifications, or repairs to oil spill response equipment or require the Lessee to remove response equipment from being listed in the OSRP if it does not operate as intended. 12. Training. The OSRP must include a description of the training necessary to ensure that the QI, IMT, OSRO(s) and SROT(s) are sufficiently trained to perform their respective duties. The Lessee must ensure that the IMT, OSRO(s), and SROT(s) receive annual			

Measure ID[1]	Measure Name	Description	Resource Area Mitigated	Anticipated Enforcing Agency	Previously Applied as a COP Term and Condition
		training. The Lessee's OSRP must provide the most recent dates of applicable training(s) completed by the QI, IMT, OSRO(s) and SROT(s). The Lessee must maintain and retain training records for 3 years and must provide the training records to BSEE upon request. 13. Worst-Case Discharge (WCD) Scenario. The OSRP must describe the WCD scenario for the facility containing the highest cumulative volume of oil(s). For a regional OSRP covering multiple sub-regions, a WCD scenario must be described for each sub-region. a. If multiple candidate WCD facilities contain the same cumulative volume of oil(s), the WCD facility is the one closest to shore. b. The WCD facility must be identified on the facility map consistent with the "Facility and Oil Information" section. c. The OSRP must identify the subset of oil spill response equipment from the inventory listed in the OSRP that will be used to contain and recover the WCD volume. The OSRP must include timeframes for response resources to deploy to the WCD facility. Timeframes must include times for equipment procurement, loadout, travel, and deployment. 14. Stochastic Trajectory Analysis. The OSRP must include a stochastic spill trajectory analysis for the WCD facility. For a regional OSRP containing multiple WCD scenarios, a stochastic trajectory analysis must be included for each WCD scenario. The stochastic trajectory analysis must: a. Be based on the WCD volume. b. Be conducted for the longest period that the discharged oil would reasonably be expected to persist on the water's surface, or 14 days, whichever is shorter. c. Identify the probabilities for oiling on the water's surface and on shorelines, and minimum travel times for the transport of the oil over the duration of the model simulation. Oiling probabilities and minimum travel times must be calculated for exposure threshold concentrations reaching 10 grams per square meter. Stochastic analysis must incorporate a minimum of 100 different trajectory simulations using random start dates selected over a multi-year period. 15. Response Plan Exercise. The OSRP must include a triennial exercise plan for review and concurrence by BSEE to ensure that the Lessee is able to respond quickly and effectively whenever oil is discharged from the Lessee's facilities. Compliance with the National Preparedness for Response Exercise Program guidelines will satisfy the exercise requirements of this section. If the Lessee chooses to follow an alternative exercise program, the OSRP must provide a description of that program. For a regional OSRP covering multiple sub-regions, the IMT exercise scenarios must be rotated between each sub-region within the triennial exercise period. a. The Lessee must conduct an annual scenario-based notification exercise, an annual scenario-based IMT tabletop exercise (if applicable), and, during the triennial exercise period, at least one functional exercise. b. The Lessee must conduct an annual oil spill response equipment deployment exercise. c. The Lessee must notify BSEE OSPD at least 30 days in advance of any exercise it intends to conduct for compliance with this condition. d. BSEE will advise the Lessee about the options it has to satisfy these requirements and may require changes in the type, frequency, or location of the required exercises, exercise objectives, equipment to be deployed and operated, or deployment procedures or strategies. e. BSEE may evaluate the results of the exercises and advise the Lessee of any needed changes in response equipment, procedures, tactics, or strategies. f. BSEE may periodically initiate unannounced exercises to test the Lessee's spill preparedness and response capabilities. g. The Lessee must maintain and retain exercise records for at least 3 years and must provide the exercise records to BSEE upon request. 16. OSRP Review and Update. The Lessee must review and update the entire OSRP at least once every 3 years and more frequently as needed, starting from the date the OSRP was initially approved. The Lessee must send a written notification to BSEE OSPD upon completion of this review and submit any updates for concurrence. BSEE OSPD may require the Lessee to make changes to the OSRP at any time if it is determined to be outdated or to contain significant inadequacies as discovered through a review of the Lessee's OSRP, information obtained during exercises or actual spill responses, or other relevant information obtained by BSEE OSPD. 17. OSRP Maintenance. The Lessee must submit a revised OSRP to BSEE OSPD within 15 days if any of the following conditions occur: a. The Lessee experiences a change that would significantly reduce their oil spill response capability. b. The calculated WCD volume has significantly increased.			

Measure ID[1]	Measure Name	Description	Resource Area Mitigated	Anticipated Enforcing Agency	Previously Applied as a COP Term and Condition
		c. The Lessee removes a contracted IMT, OSRO, or SROT from the Lessee's plan. d. There has been a significant change to the applicable area contingency plan(s).			

[1] AMMM measure identification numbers start with a prefix corresponding to the resource or resources for which they were designed to mitigate and are defined as follows: AQ = air quality; BB = Birds and Bats; BEN = Benthic Resources; BIR = Birds; COMFIS = Commercial and For-Hire Recreational Fishing; CUL = Cultural Resources ; EJ = Environmental Justice; MM = Marine Mammal; MMST = Marine Mammals and Sea Turtles; MUL = Multiple; NAV = Navigation; OU = Other Uses; REC = Recreation and Tourism; ST = Sea Turtle; STF = Sea Turtle and ESA-listed Fish species; VIS = Scenic and Visual Resources; WQ = Water Quality

µPa = micro pascal; ACHP = Advisory Council on Historic Preservation; ADCP = acoustic Doppler current profiling; ADLS = aircraft detection lighting system; ADS-B = automatic dependent surveillance–broadcast; AIS = automatic identification system; ARSR-4 = air route surveillance radar; ASLF = ancient submerged landform features; ASR = airport surveillance radar; ATONs = federal aids to navigation; AUV = autonomous underwater vehicle; BA = biological assessment; BBPCMP = Bird and Bat Post-Construction Monitoring Plan; BMP = best management practices; BOEM = Bureau of Ocean Energy Management; BSEE = Bureau of Safety and Environmental Enforcement; CFR = code of federal regulation; COP = Construction and Operations Plan; CSV = comma-separated values; dB = decibel; DMA = dynamic management area; DOE = Department of Energy; DOI = Department of the Interior; DPS = distinct population segment; EEZ = exclusive economic zone; EJ = environmental justice; ESA = Endangered Species Act; FAA = Federal Aviation Administration; FIR = fabrication and installation report; FSC = Finance Section Chief; GHG = greenhouse gas; GPS = global positioning system; HDD = horizontal directional drilling; HOV = human-occupied vehicles; HPTPS = historic property treatment plans; HRG = high resolution geophysical; IC = Incident Commander; ICS = Incident Command System; IMO = international maritime organization; IMPLAN = impact analysis for planning; IMT = Incident Management Team; IOOS = integrated ocean observing system; IR = inadvertent returns; ISO = independent system operator; JPEG = joint photographic experts group; kHz = kilohertz; km = kilometers; LBL = long baseline; LFC = low frequency cetaceans; LSC = Logistics Section Chief; MEC = munitions and explosives of concern; MMP = marine minerals program; MMPA = Marine Mammal Protection Act; MWh = megawatt hours; NARW = North Atlantic right whale; NAVTEX = navigational telex; NEFSC = Northeast Fisheries Science Center; NEPA = National Environmental Policy Act; NEXRAD = Next Generation Weather Radar; NGOs = non-governmental organization; NJDEP = New Jersey Department of Environmental Protection; NMFS = National Marine Fisheries Service; NOAA = National Oceanic and Atmospheric Administration; NO_X = nitrogen oxides; NRHP = National Register of Historic Places; nT = nanotesla; NVDs = night vision devices; NVIC = navigation and vessel inspection circular; NYS = New York State; NYSDEC = New York State Department of Environmental Conservation; NYSDOS = New York State Department of State; NYSERDA = New York State Energy Research and Development Authority; OCS = outer continental shelf; OSC = Operations Section Chief; OSPD = Oil Spill Preparedness Division; OSRO = Oil Spill Removal Organizations; OSRP = Oil Spill Response Plan; OSS = offshore substation; PAM = passive acoustic monitoring; PATON = private aids to navigation; PDC = project design criteria; PDM = pile-driving monitoring plan; PEIS = programmatic environmental impact statement; PIT = passive integrated transponder; PMT = pressure monitoring transducer; POI = point of interconnection; PSC = Planning Section Chief; PSO = protected species observer; PTS = permanent threshold shift; QI = Qualified Individual; ROSA = Responsible Offshore Science Alliance; ROV = remotely operated vehicle; RSLL = received sound level limit; RTO = regional transmission organization; RWSC = Regional Wildlife Science Collaborative; SAA = state agreement approach; SAR = search and rescue; SBP = sub-bottom profiler; SCPP = scour and cable protection plan; SCRAM = stochastic collision risk assessment for movement; SF_6 = sulfur hexafluoride; SFV = sound field verification; SHPOs = state historic preservation officer; SMA = seasonal management area; SMS = safety management system; SO_2 = sulfur dioxide; SROT = Spill Response Operating Teams; STDN = sea turtle disentanglement network; TIFF = tag image file format; TIMS = technical information management systems; TOYRs = time of year restrictions; USBL = ultra-short baseline; U.S.C. = United States Code; USCG = United States Coast Guard; USEPA = United States Environmental Protection Agency; USFWS = United States Fish and Wildlife Service; UTC = universal time coordinated; UXO = unexploded ordnance; WCD = worst-case discharge; WTGs = wind turbine generators

Appendix H: Seascape, Landscape, and Visual Impact Assessment

H.1 Introduction

This appendix describes the seascape, landscape, and visual impact assessment (SLVIA) methodology and key findings that the Bureau of Ocean Energy Management (BOEM) used to identify the potential impacts of offshore wind structures (wind turbine generators [WTGs] and offshore substations [OSSs]) on scenic and visual resources in the geographic analysis area. The SLVIA methodology applies to any offshore wind energy development proposed for the Outer Continental Shelf (OCS) and incorporates by reference the detailed description of the methodology described in the *Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States* (BOEM 2021). The analysis in this appendix relies on and incorporates by reference the assessment of the six New York Bight (NY Bight) lease areas conducted by Argonne National Laboratory (Argonne) and BOEM in accordance with the SLVIA methodology, *Ocean, Seascape, Landscape, and Visual Impact Assessment of the New York Bight Offshore Wind Lease Areas* (Argonne 2024).

Section H.2, *Method of Analysis*, of this appendix describes the specific methodology used to apply the SLVIA methodology to the NY Bight projects, and Section H.3, *SLVIA Results,* summarizes the wind farm distances, fields of view (FOVs), noticeable elements, visual contrasts, scale of change, and prominence that contributed to the determination of impact levels for ocean, seascape, and landscape and each key observation point (KOP) for the NY Bight projects. Section H.4, *Cumulative Impacts of NY Bight Projects*, describes the cumulative impacts from the NY Bight projects in combination with other ongoing and planned offshore wind projects. Detailed maps of character areas, KOPs, and other scenic resources within view of each lease area and of the six NY Bight lease areas collectively are contained in Argonne (2024). Visual simulations of the NY Bight projects alone, other ongoing and planned offshore wind projects without the NY Bight projects, and other offshore wind projects in combination with the NY Bight projects are provided on BOEM's NY Bight website: https://www.boem.gov/renewable-energy/state-activities/new-york-bight.

The demarcation line between seascape and open ocean is the U.S. states jurisdictional boundary, 3 nautical miles (nm) (3.45 statute miles [5.5 kilometers]) seaward from the coastline (U.S. Congress Submerged Lands Act, 1953). This line coincides with the area of sea visible from the shoreline. The line defining the separation of seascape and landscape is based on the juxtaposition of apparent seacoast and landward landscape elements, including topography, water (bays and estuaries), vegetation, and structures.

H.2 Method of Analysis

The SLVIA has two separate but linked parts: the open ocean, seascape, and landscape impact assessment (SLIA) and the visual impact analysis (VIA). The SLIA analyzes and evaluates the *sensitivity* of the receptor and the *magnitude of change* in consideration of impacts on both the physical elements and features that make up a landscape, seascape, or open ocean. The VIA analyzes and evaluates the impacts on people from adding the proposed development to views from selected viewpoints.

The inclusion of both the SLIA and VIA in the BOEM SLVIA methodology is consistent with the National Environmental Policy Act's (NEPA) objective of providing Americans with aesthetically and culturally pleasing surroundings and its requirement to consider all potentially significant impacts of development.

H.2.1 SLIA Methodology

The SLIA inventories and describes the visual character of the ocean and the coastal landscape and seascape. It analyzes and evaluates the magnitude of change and the sensitivity of the receptor in consideration of impacts on both the physical elements and features that make up the open ocean, seascape, or landscape. The magnitude of change depends on a project's scale or degree of change, geographic extent, and duration and reversibility.

Sensitivity is measured by the impact receptor's susceptibility to change, its ability to accommodate the impacts of a proposed project without changing its basic character, and its perceived value to society. These impacts affect the "feel," "character," or "sense of place" of an area of open ocean, seascape, or landscape, rather than the composition of a view from a particular place. Social value is based on the aesthetic, perceptual, and experiential aspects of the landscape, seascape, or open ocean that make it distinctive. In the SLIA, the impact receptors (the entities that are potentially affected by the proposed project) are the open ocean/seascape/landscape itself and its components, both its physical features and its distinctive character.

H.2.2 VIA Methodology

The VIA analyzes and evaluates the impacts on people of adding the proposed development to views from selected viewpoints. It also evaluates the change to the composition of the view itself and assesses how the people who are likely to be at that viewpoint may be affected by the change to the view. Enjoyment of a particular view is dependent on the viewer, and, in the VIA, the impact receptors are people.

The VIA for an offshore wind project assesses the impacts of adding the proposed development to views from selected viewpoints (referred to as key observation points or KOPs). The VIA assesses how the change to the view itself caused by the addition of the wind energy project components, such as seeing wind turbines instead of an open ocean horizon, affects people who are likely to be at the viewpoint. The change to the view as a result of adding the proposed project may affect viewers' experience of that particular view. How the addition of the project to the view affects the viewers' experiences and their responses depends in part on who they are, what they are doing when viewing the facility, and how much they value the view. The experience of a particular view is dependent on the viewers, and, as noted, in the VIA, the impact receptors are people, rather than the seascape or landscape itself.

H.2.3 Project Visibility Factors

WTG visibility would be variable throughout the day depending on many factors. View angle, sun angle, and atmospheric conditions would affect the WTG visibility. Visual contrast of WTGs would vary throughout the day depending on the visual character of the horizon's backdrop and whether the WTGs are backlit, side-lit, or front-lit. If less visual contrast is apparent in the morning hours, then it is likely that the visual contrast may be more pronounced in the afternoon. The inverse is possible as well. These effects are also influenced by varying atmospheric conditions, direction of view, distance between the viewer and the WTGs, and elevation of the viewer.

At closer distances, approximately 16 miles (26 kilometers) or closer, the form of the 1,312-foot (400-meter) WTG may be the dominant visual element creating the visual contrast regardless of color. At approximately 12 miles (19 kilometers) or closer the form of the 853-foot (260-meter) WTG may be the dominant visual element creating contrast regardless of color. At greater distances, color may become the dominant visual element creating visual contrast under certain visual conditions that gives visual definition to the WTG's form and line. As the elevation of the viewer increases, earth curvature (EC) has a decreasing effect on the visible height of individual WTGs, allowing a greater proportion of the turbine infrastructure to be seen.

The noticeable daytime and nighttime elements of the project's WTGs and OSSs and their viewshed distances are listed in Table H-1 for 1,312-foot (400-meter) WTGs and in Table H-4 for 853-foot (260-meter) WTGs. Each WTG would have two L-864 flashing red obstruction lights at the top of the nacelle, one of which is required to be lit (BOEM 2021). WTGs would have additional intermediate lighting on the tower utilizing low-intensity red flashing (L-810) obstruction lighting. Line-of-sight calculations for onshore viewers (5.9-foot [1.8-meter] eye level) are based on intervening EC screening (7.98-inch [20.3-centimeter] height per mile). Heights of WTG and OSS components are stated relative to mean lower low water and highest astronomical tide.

Table H-2 and Table H-3 for 1,312-foot (400-meter) WTGs and Table H-5 and Table H-6 for 853-foot (260-meter) WTGs indicate the NY Bight projects' effects based on horizontal and vertical FOV, respectively, defined as the extent of the observable landscape seen at any given moment, usually measured in degrees (BOEM 2021). The horizontal FOV for each KOP is listed in Argonne (2024). FOVs are valid and reliable indicators of the magnitude of view occupation by NY Bight project facilities.

Table H-1. Heights of noticeable[1] 1,312-foot WTG elements and OSS, and visible distances[2]

Noticeable Element[1]	Height in Feet (Meters)	Visible Distance[2] in Miles (Kilometers)
Rotor Blade Tip	1,312 (400) MLLW	0–47.4 (76.3)
Upper Aviation Light	728 (221.9) MLLW	0-36.1 (58.1)
Nacelle	718 (218.8) MLLW	0-35.8 (57.6)
Hub	706 (215.2) MLLW	0-35.6 (57.3)
Mid-tower Navigation Light	353 (107.6) MLLW	0-26.0 (41.8)
OSS	295.3 (90.0) HAT	0–24.1 (38.9)
Yellow Tower Base Color	50 (15.2) HAT	0–11.5 (18.5)

[1] Perception of project elements, from 5.9 feet (1.8 meters) human eye-level while standing at mean sea level, involves static distance-related sizes, forms, lines, colors, and textures; variable daytime lighting conditions; variable nighttime light conditions; and variable meteorological conditions.
[2] Based on intervening EC and clear-day conditions.
HAT = highest astronomical tide; MLLW = mean lower low water

Table H-2. Horizontal FOV occupied by the 1,312-foot WTGs

State	Noticeable Element	Width[1] Miles (Kilometers)	Distance[2] Miles (Kilometers)	Horizontal FOV	Human FOV	Percent of FOV
New York	Wind turbine array	28.9 (46.5)	23.6 (38.0)	50°	124°	40%
New Jersey	Wind turbine array	46.7 (75.1)	30.7 (49.4)	57°	124°	46%

[1] Maximum extent of the visible wind turbine array.
[2] Nearest onshore distance to the wind turbine array: Atlantique Beach, New York, and Long Island Beach, New Jersey.

Table H-3. Vertical FOV occupied by the 1,312-foot WTGs

State	Noticeable Element	Height Feet (meters)	Distance Miles (Kilometers)	Height Above Horizon[1] Feet (Meters)	Vertical FOV	Human FOV	Percent of FOV
New York	Rotor Blade Tip	1,312 (400.0) MLLW	23.6 (38.0)	1,036.5 (311.5)	0.48°	55°	0.8 %
New Jersey	Rotor Blade Tip	1,312 (400.0) MLLW	30.7 (49.4)	799.4 (311.5)	0.28°	55°	0.5 %

[1] Based on intervening EC, clear-day, and clear-night conditions.
MLLW = mean lower low water

Table H-4. Heights of noticeable[1] 853-foot WTG elements and OSS, and visible distances[2]

Noticeable Element[1]	Height in Feet (Meters)	Visible Distance[2] in Miles (Kilometers)
Rotor Blade Tip	853 (260.0) MLLW	0–38.7 (62.3)
Aviation Light	513 (156.4) MLLW	0–30.8 (49.6)
Nacelle	503 (153.3) MLLW	0–30.5 (49.1)
Hub	492 (150.0) MLLW	0–30.2 (48.6)
OSS	295.3 (90.0) HAT	0–24.1 (38.7)
Mid-tower Navigation Light	246 (75.0) MLLW	0–22.2 (35.7)
Yellow Tower Base Color	50 (15.2) HAT	0–11.5 (18.5)

[1] Perception of project elements, from 5.9 feet (1.8 meters) human eye-level while standing at mean sea level, involves static distance-related sizes, forms, lines, colors, and textures; variable daytime lighting conditions; variable nighttime light conditions; and variable meteorological conditions.
[2] Based on intervening EC and clear-day conditions.
HAT = highest astronomical tide; MLLW = mean lower low water

Table H-5. Horizontal FOV occupied by the 853-foot WTGs

State	Noticeable Element	Width[1] Miles (Kilometers)	Distance[2] Miles (Kilometers)	Horizontal FOV	Human FOV	Percent of FOV
New York	Wind turbine array	19.0 (30.6)	23.6 (38.0)	39°	124°	31%
New Jersey	Wind turbine array	23.9 (38.5)	30.7 (49.4)	38°	124°	31%

[1] Maximum extent of the visible wind turbine array.
[2] Nearest onshore distance to the wind turbine array: Atlantique Beach, New York, and Long Island Beach, New Jersey.

Table H-6. Vertical FOV occupied by the 853-foot WTGs

State	Noticeable Element	Height Feet (meters)	Distance Miles (Kilometers)	Height Above Horizon[1] Feet (Meters)	Vertical FOV	Human FOV	Percent of FOV
New York	Rotor Blade Tip	853 (260.0) MLLW	23.6 (38.0)	577.5 (176.0)	0.27°	55°	0.4%
New Jersey	Rotor Blade Tip	853 (260.0) MLLW	30.7 (49.4)	340.4 (103.7)	0.12°	55°	0.2%

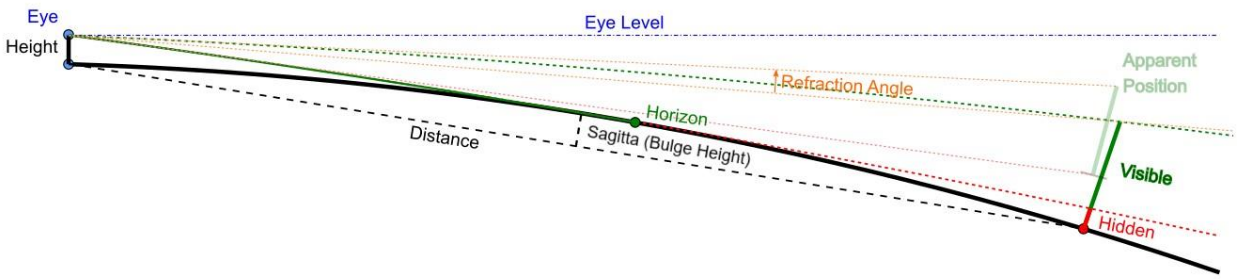
[1] Based on intervening EC, clear-day, and clear-night conditions.
MLLW = mean lower low water

While the coastal shoreline has a prevailing eastward viewing direction, localized views may vary from southeast to northeast. All cardinal directions are conceivable when viewing from a lighthouse or a water vessel at sea. When viewing from onshore toward a southerly direction and scanning to the east and west, the color of the horizon backdrop often will vary. Variation will continue as the sun arcs across the sky from sunrise to sunset. Depending on sun angle, the backdrop sky color may have various intensities of white to gray and sky blue to pale blue to dark blue-gray. Partly cloudy to overcast conditions will also influence the color make-up of the horizon’s backdrop. The sunrise and sunset have varying degrees of light blue to dark blue, light and dark purples intermixed with oranges, yellows, and reds. Partly cloudy skies may increase the remarkable color effects during the sunset and sunrise periods of the day.

When placing WTGs offshore, the visual interplay and contrasting elements in form, line, color, and texture may vary with the ever-changing character of the backdrop. Front-lit WTGs may have strong color contrast against a darker gray sky, giving definition to the WTG's vertical form and line contrast to the ocean's horizontal character and the line where the sea meets sky, or visually dissipates against a whiter backdrop created by high levels of evaporative atmospheric moisture during clear sunny days. Partly cloudy skies may create varying degrees of sunlight reflecting off the white wind turbines, placing some WTGs in the shadow and making them appear a darker gray and less conspicuous while highlighting others with a bright white color contrast. The level of noticeability would be directly proportional to the degree of visual contrast and scale of change between the WTGs and the corresponding backdrop. Visual simulations prepared of the NY Bight projects depict both maximum visibility, illustrating no atmospheric haze, and predicted visibility, depicting visibility with the atmospheric conditions on the day the photograph was taken. These variations through the course of the day may result in periods of moderate to major visual effects while at other times of day would have minor or negligible effects.

WTG blade motion also affects visibility. Empirical studies of offshore wind turbine visibility have shown that WTG blade movement is routinely visible at distances of 21 miles (34 kilometers) or less and as far as 26 miles (42 kilometers) (Sullivan et al. 2013). In a visually empty seascape, the rotational movement of the turbines can dominate the scene during the day. Contrary to static turbine noticeability, blade motion is visible regardless of lighting conditions, sun angle, and sky contrast levels. Blade motion contributes substantially to visual contrast and may contribute relatively more at shorter viewing distances (Sullivan 2013). Blade movement noticeability would be dependent on meteorological conditions. It is critical to note that the studies cited above were conducted on smaller WTGs than those considered for the NY Bight projects in the NY Bight Programmatic Environmental Impact Statement [PEIS] or other offshore wind projects along the U.S. eastern seaboard; therefore, noticeability distances would increase with larger wind turbines.

Atmospheric refraction of light rays causes fluctuations in the extents and appearances of offshore and onshore facilities. It results from the bending of light rays between viewers and objects due to current air temperature, water vapor, and barometric pressure (Bislins 2022). Atmospheric refraction can increase the visibility of objects, making them look larger or taller, depending on conditions, as depicted in Figure H-1. Table H-7 provides a summary of increased visibility ranges for the nearest beach viewers for each lease area and both turbine sizes based on the average sea level refraction calculation coefficient of 0.17 (Bislins 2022) applied to the turbine blade tip viewshed distances. Daytime and nighttime atmospheric refraction-based visibility varies with sea level's continuous increases and decreases in temperature, water vapor, and barometric pressure.



Source: Bislins 2022

Figure H-1. Effects of atmospheric refraction and earth curvature on WTG visibility

Table H-7. Atmospheric refraction summary for all lease areas for 1,312-foot and 853-foot WTGs

Lease Area	1,312-Foot WTG		853-Foot WTG	
	Rotor Blade Tip Increased Visibility Feet (Meters)	Nearest Beach Increased Visibility Feet (Meters)	Rotor Blade Tip Increased Visibility Feet (Meters)	Nearest Beach Increased Visibility Feet (Meters)
OCS-A 0537	From 0.0 to 233.8 (71.3) = 233.8 (71.3)	From 167 (50.9) to 375 (114.3) = 208 (63.4)	From 0.0 to 158 (48.2) = 158 (48.2)	Not visible
OCS-A 0538	From 0.0 to 233.8 (71.3) = 233.8 (71.3)	From 296 (90.2) to 482 (146.9) = 186 (56.7)	From 0.0 to 158 (48.2) = 158 (48.2)	From 0 to 26.8 (43.1) = 26.8 (43.1)
OCS-A 0539	From 0.0 to 233.8 (71.3) = 233.8 (71.3)	From 535 (163.1) to 678 (206.7) = 143 (43.6)	From 0.0 to 158 (48.2) = 158 (48.2)	From 94.5 (152.1) to 234.3 (377.1) = 139.8 (225)
OCS-A 0541	From 0.0 to 233.8 (71.3) = 233.8 (71.3)	From 799 (243.5) to 895 (272.8) = 96 (29.3)	From 0.0 to 158 (48.2) = 158 (48.2)	From 340 (103.6) to 436 (132.9) = 96 (29.3)
OCS-A 0542	From 0.0 to 233.8 (71.3) = 233.8 (71.3)	From 615 (187.5) to 744 (226.8) = 129 (42.3)	From 0.0 to 158 (48.2) = 158 (48.2)	From 0.0 to 69.1 (111.0) = 69.1 (111.0)
OCS-A 0544	From 0.0 to 233.8 (71.3) = 233.8 (71.3)	From 1,028 (313.3) to 1,083 (330.1) = 55 (16.8)	From 0.0 to 158 (48.2) = 158 (48.2)	From 569 (173.4) to 624 (190.2) = 55 (16.8)

Visibility thresholds have been described and rated through research by Robert Sullivan at Argonne based on WTGs in England. Table H-8 describes visibility threshold levels and ratings based on this work. This research, along with distance and observer elevation considerations, informed by the visual simulations, EC calculations, horizontal FOV, and vertical FOV in undeveloped open ocean provide the basis for evaluating visibility.

Table H-8. Visibility threshold levels

Visibility Rating	Description
Visibility level 1. Visible only after extended, close viewing; otherwise, invisible.	An object/phenomenon that is near the extreme limit of visibility. It could not be seen by a person who was unaware of it in advance and looking for it. Even under those

Visibility Rating	Description
	circumstances, the object can be seen only after looking at it closely for an extended period.
Visibility level 2. Visible when scanning in the general direction of the subject; otherwise, likely to be missed by casual observers.	An object/phenomenon that is very small and/or faint, but when the observer is scanning the horizon or looking more closely at an area, can be detected without extended viewing. It could sometimes be noticed by casual observers; however, most people would not notice it without some active looking.
Visibility level 3. Visible after a brief glance in the general direction of the study subject and unlikely to be missed by casual observers.	An object/phenomenon that can be easily detected after a brief look and would be visible to most casual observers, but without sufficient size or contrast to compete with major landscape/seascape elements.
Visibility level 4. Plainly visible, so could not be missed by casual observers, but does not strongly attract visual attention or dominate the view because of its apparent size, for views in the general direction of the study subject.	An object/phenomenon that is obvious and with sufficient size or contrast to compete with other landscape/seascape elements, but with insufficient visual contrast to strongly attract visual attention and insufficient size to occupy most of an observer's visual field.
Visibility level 5. Strongly attracts the visual attention of views in the general direction of the study subject. Attention may be drawn to the strong contrast in form, line, color, or texture, luminance, or motion.	An object/phenomenon that is not large but contrasts with the surrounding landscape elements so strongly that it is a major focus of visual attention, drawing viewer attention immediately and tending to hold attention. Has strong contrasts in form, line, color, and texture. In addition, bright light sources and moving objects contribute substantially to drawing viewer attention. The study subject's visual prominence noticeably interferes with views of nearby landscape/seascape elements.
Visibility level 6. Dominates the view because the study subject fills most of the visual field of views in its general direction. Strong contrasts in form, line, color, texture, luminance, or motions may contribute to view dominance.	An object/phenomenon with strong visual contrasts that is so large it occupies most of the visual field, and views cannot be avoided except by turning one's head more than 45 degrees from a direct view of the object. The phenomenon is the major focus of visual attention, and its large apparent size is a major factor in its view dominance. The study subject's visual prominence noticeably detracts from views of other landscape/seascape elements.

Source: Sullivan et. al 2013.

H.2.4 Geographic Scope

As described in Section 3.6.9, *Scenic and Visual Resources,* of the PEIS, the scenic and visual resources geographic analysis area extends approximately 47.4 miles (76.3 kilometers) offshore and 50 miles (80.5 kilometers) onshore to capture potential views of the NY Bight projects, and includes the coastlines from Atlantic City, New Jersey, to the Shinnecock Indian Nation in Long Island, New York, as well as elevated viewpoints of national significance (e.g., Empire State Building) (Argonne 2024).

H.2.5 Defining Potential Impacts

Project activities for all stages of the project life cycle (construction and installation, operations and maintenance [O&M], and decommissioning) are assessed against the environmental baseline to identify the potential interactions between a project and the seascape, landscape, and viewers. Analysis of visual impacts for the onshore geographic analysis area should include an assessment of landfalls, buried onshore export cables, onshore substation/converter station, and transmission connections to the electric grid. Because the locations of onshore infrastructure for the NY Bight projects are currently unknown, this assessment only analyzes impacts from offshore structures. Visual impacts from onshore infrastructure will be analyzed during the project-specific NEPA review for each Construction and Operations Plan (COP). Potential impacts from offshore infrastructure are assessed to determine an impact level consistent with the definitions in Table H-9.

Table H-9. Definitions of potential adverse impact levels for SLIA and VIA

Impact Level	Impact Type	Definition
Negligible	Adverse	**SLIA**: Very little or no effect on seascape/landscape unit character, features, elements, or key qualities either because unit lacks distinctive character, features, elements, or key qualities; values for these are low; or project visibility would be minimal. **VIA**: Very little or no effect on viewers' visual experience because view value is low, viewers are relatively insensitive to view changes, or project visibility would be minimal.
Minor	Adverse	**SLIA**: The project would introduce features that may have low to medium levels of visual prominence within the geographic area of an ocean/seascape/landscape character unit. The project features may introduce a visual character that is slightly inconsistent with the character of the unit, which may have minor to medium negative effects on the unit's features, elements, or key qualities, but the unit's features, elements, or key qualities have low susceptibility or value. **VIA**: The visibility of the project would introduce a small but noticeable to medium level of change to the view's character; have a low to medium level of visual prominence that attracts but may or may not hold the viewer's attention; and have a small to medium effect on the viewer's experience. The viewer receptor sensitivity/susceptibility/value is low. If the value, susceptibility, and viewer concern for change is medium or high, then evaluate the nature of the sensitivity to determine if elevating the impact to the next level is justified. For instance, a KOP with a low magnitude of change, but that has a high level of viewer concern (combination of susceptibility/value), may justify adjusting to a moderate level of impact.
Moderate	Adverse	**SLIA**: The project would introduce features that would have medium to large levels of visual prominence within the geographic area of an ocean/seascape/landscape character unit. The project would introduce a visual character that is inconsistent with the character of the unit, which may have a moderate negative effect on the unit's features, elements, or the key qualities. In areas affected by large magnitudes of change, the unit's features, elements or key qualities have low susceptibility and/or value. **VIA:** The visibility of the project would introduce a moderate to large level of change to the view's character, may have a moderate to large level of visual prominence that attracts and holds but may or may not dominate the viewer's attention, and has a moderate effect on the viewer's visual experience. The viewer receptor sensitivity/susceptibility/value is medium to low. Moderate impacts are typically associated with medium viewer receptor sensitivity (combination of susceptibility/value) in areas where the view's character has medium levels of change, or low viewer receptor sensitivity (combination of susceptibility/value) in areas where the view's character has large changes to the character. If the value, susceptibility, and viewer concern for change is high, then evaluate the nature of the sensitivity to determine if elevating the impact to the next level is justified.

Impact Level	Impact Type	Definition
Major	Adverse	**SLIA:** The project would introduce features that would have dominant levels of visual prominence within the geographic area of an ocean/seascape/landscape character unit. The project would introduce a visual character that is inconsistent with the character of the unit, which may have a major negative effect on the unit's features, elements, or key qualities. The concern for change (combination of susceptibility/value) to the character unit is high. **VIA:** The visibility of the project would introduce a major level of character change to the view; will attract, hold, and dominate the viewer's attention; and have a moderate to major effect on the viewer's visual experience. The viewer receptor sensitivity/susceptibility/value is medium to high. If the magnitude of change to the view's character is medium, but the susceptibility or value at the KOP is high, then evaluate the nature of the sensitivity to determine if elevating the impact to major is justified. If the sensitivity (combination of susceptibility/value) at the KOP is low in an area where the magnitude of change is large, then evaluate the nature of the sensitivity to determine if lowering the impact to moderate is justified.

H.2.6 Laws, Ordinances, and Regulations

Open ocean, seascape, landscape, and visual resource protection and management laws, ordinances, and regulations are identified in Table H-10.

Table H-10. Laws, Ordinances, and Regulations

Jurisdiction	Authority	Objectives
Federal		
BOEM	Code of Federal Regulations (CFR) Title 30 of the CFR Part 585, Subpart F, Plans and Information Requirements	This title provides guidance on survey requirements, project-specific information, and information to meet the requirements of the Outer Continental Shelf Lands Act, NEPA, and other applicable laws and regulations. It also specifies that to comply with NEPA and other relevant laws, the COP must include a detailed description of visual resources and various social and economic resources that could be affected by the proposed project, that would be addressed in an SLVIA.
BOEM	Outer Continental Shelf Lands Act (OCSLA), Title 43, Chapter 29, Subchapter I, Section 1301 (1953)	The primary purpose of the OCSLA is to facilitate the federal government's leasing of its offshore mineral resources and energy resources. As set forth in the Energy Policy Act of 2005, OCSLA was amended to authorize the Department of the Interior (DOI) to issue submerged land leases for alternate uses and alternative energy development on the OCS. Through this amendment and subsequent delegation by the Secretary of the Interior, BOEM has the authority to issue these leases and regulate activities that occur within them, including the authorization of a COP.
BOEM	Submerged Lands Act (SLA) of 1953	The SLA grants coastal states title to natural resources located within their coastal submerged lands out to 3 miles (4.8 kilometers) from their coastline.
BOEM	National Environmental Policy Act (NEPA)	NEPA was signed into law in 1970 and set forth a national environmental policy in the United States meant to ensure federal agencies consider the significant environmental consequences of their proposed actions and inform the public about their decision making. NEPA established the Council on Environmental Quality

Jurisdiction	Authority	Objectives
		(CEQ) to advise agencies on the NEPA process and to oversee and coordinate the development of federal environmental policy. The CEQ issued revised NEPA regulations (40 CFR 1500-1508) in 2021. The regulations include procedures to be used by federal agencies for the NEPA review process.
BOEM	Clean Air Act (CAA) of 1970	The CAA authorized the U.S. Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment. The states were directed to develop State Implementation Plans (SIPs), which consist of emission reduction strategies, with the goal of achieving the NAAQS by the legislated date. BOEM has jurisdiction over OCS air emissions in the Gulf of Mexico west of 87.5 degrees west longitude (off the coasts of Texas, Louisiana, Mississippi, and Alabama). BOEM also has jurisdiction over OCS air emissions within the Chukchi and Beaufort Seas in Alaska according to the Consolidated Appropriations Act of 2012. In all other OCS areas, the USEPA has jurisdiction, as mandated by Section 328 of the CAA.
BOEM	Coastal Zone Management Act (CZMA) (1972)	The U.S. Congress recognized the growth in the coastal zone by passing the CZMA, which is administered by the National Oceanic and Atmospheric Administration (NOAA). The goal is to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone." Authorized by the CZMA in 1972, the Coastal Zone Management Program (CZMP) was established as a voluntary partnership between the federal government and U.S. coastal and Great Lakes states and territories (BOEM 2009).
BOEM	National Historic Preservation Act 1966	This act establishes a preservation program and a system of protections, which encourage both the identification and protection of historic resources. As part of this program, historic districts and individual properties are either listed or eligible for listing on the National Register of Historic Places (NRHP) or National Historic Landmarks (NHL).
BOEM	Inflation Reduction Act of 2022	This act offers funding, programs, and incentives to accelerate the transition to a clean energy economy and will likely drive significant deployment of new clean electricity resources. The act's incentives reduce renewable energy costs for organizations, businesses, nonprofits, educational institutions, and state, local, and tribal organizations. Taking advantage of Inflation Reduction Act incentives, such as tax credits, is key to lowering greenhouse gas emission footprints and accelerating the clean energy transition.
BOEM	Information Guidelines for a Renewable Energy Construction and Operations Plan (COP). Version 4.0. (BOEM 2020)	BOEM's guidelines indicate that the visual resource assessment should apply appropriate viewshed mapping, photographic photo simulations, and field inventory techniques to determine the visibility of the proposed project at scenic viewpoints.
BOEM	Assessment of Seascape, Landscape,	This OCS Study provides the methodology for assessing the seascape, landscape, and visual impacts of offshore wind within a

Jurisdiction	Authority	Objectives
	and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States (2021)	particular study area. Developers are to use this guidance in preparation as part of a COP for their lease development. This assessment is to be reviewed by BOEM.
State of New York		
New York State Department of State (NYSDOS)	New York State Coastal Management Program and Final Environmental Impact Statement (NYSDOC 2017)	Policy 24: Prevent impairment of scenic resources of statewide significance. Policy 25: Protect, restore, or enhance natural and man-made resources which are not identified as being of statewide significance, but which contribute to the overall scenic quality of the coastal area.
New York State Department of Environmental Conservation (NYS DEC)	NYSDEC Policy DEP-00-2: Assessing and Mitigating Visual and Aesthetic Impacts	The purpose of this policy is to guide the evaluation of visual impacts for proposed projects as they relate to scenic and aesthetic resources of statewide significance.
New York State Department of State (NYSDOS)	Long Island Sound Coastal Management Program (LIS CMP) (1999) (NYSDOS 1999)	Policy #3: Enhance visual quality and protect scenic resources throughout Long Island Sound. The LIS CMP provides a recommendation to protect scenic resources within the Long Island Sound coastal region by having the NYSDOS and local government undertake a comprehensive scenic resources evaluation of the Long Island Sound Coastal Area and prepare appropriate area designations. This would include scenic areas of statewide significance (SASS). Another recommendation is to identify, preserve, and provide access to regionally important vistas. The NYSDOS proposed to evaluate scenic land and water vistas as part of the SASS Program (Executive Law, Article 42 and 19 NYCRR Part 602.5c). The NYSDOS will also work with Local Waterfront Revitalization Programs to identify locations for protection and enhancement of visual access.
South Shore Estuary Reserve	Long Island South Shore Estuary Reserve Comprehensive Management Plan (CMP) 2022	Originally implemented in 2001, The Long Island South Shore Estuary Reserve CMP is the result of The Long Island South Shore Estuary Reserve Act passed in 1993 creating the Long Island South Shore Estuary Reserve (Reserve). The act also implemented the Long Island South Shore Estuary Reserve Act Council (Council) whose task was to design a CMP to protect the reserve and its inhabitants. This CMP emphasizes the importance of the Long Island South Shore Estuary Ecosystem and outlines actions necessary to preserve, protect, and enhance the natural, recreational, economic, aesthetic, and educational resources that the reserve provides. The CMP discusses various components, such as: • Action 2.3.8: Reduce negative environmental consequences of duck sludge and other legacy pollutants through removal and/or restoration. The restoration of former duck farms represents an important opportunity to…improve aesthetic

Jurisdiction	Authority	Objectives
		and environmental conditions for nearby neighborhoods and provide County residents with the opportunity to access these waterways for recreational and educational purposes. • Action 4.3.4: Increase end-of-street parks and parking access to the shoreline. Implement projects that create parks at the end of streets and in vacant lots, provide public parking access, and provide benefits such as improved aesthetics and public access. Parks that utilize green infrastructure best management practices can also contribute to water quality improvement.
New York City, New York		
New York City Planning (NYCP)	New York City Waterfront Revitalization Program (WRP) (2016)	The WRP establishes New York City's policies for waterfront planning, preservation, and development projects to ensure consistency over the long term. The goal of the WRP is to maximize the benefits derived from economic development, environmental conservation, and public use of the waterfront, while minimizing any potential conflicts among these objectives (NYCP 2016). The WRP includes policies that are intended to protect and enhance scenic resources: • Policy 9: Protect scenic resources that contribute to the visual quality of the New York City coastal area. • Policy 9.1: Protect and improve visual quality associated with New York City's urban context and the historic and working waterfront. • Policy 9.2: Protect and enhance scenic values associated with natural resources.
New York City Department of City Planning	New York City Comprehensive Waterfront Plan (2021)	This plan, updated every 10 years, puts forth new strategies for an equitable, resilient and healthy waterfront in the face of climate change. Goal 1: Expand public access to the waterfront with an emphasis on equity by bridging access gaps in historically underserved areas and supporting growing waterfront communities. An important part of this goal is visual access. Clear, unobstructed sightlines down to the waterfront expands connectivity. Visual corridors typically overlap with streets and other upland connections to guide people safely to the water. Where physical access to the water cannot be achieved immediately, visual connectivity can provide communities with an opportunity to see and engage with their waterfronts and form a meaningful connection.
Suffolk County, New York		
Suffolk County	Suffolk County Comprehensive Master Plan 2035 (Suffolk County Department of Economic Development and Planning 2023)	The vision of the 2035 Plan is captured by three themes: Revitalize, Rebuild, and Reclaim, i.e., revitalize the economy; rebuild the downtowns and infrastructure; and reclaim the quality of the groundwater, surface water and terrestrial resources. The Master Plan discusses the importance of the rural water setting of Suffolk County that attracts visitors who enjoy bathing beaches, fishing, boating, and other water sports as well as hiking, bicycling, adventure tourism, and other outdoor recreation or simply viewing the scenery and historic hamlets.

Jurisdiction	Authority	Objectives
Babylon, Town of	2020-2024 Consolidated Plan & 2020 Annual Action Plan (2020)	No specific objectives are included within the plan for protecting or improving scenic views, nor beach/waterfront views.
Brookhaven, Town of	Local Waterfront Revitalization Program (Anticipated Completion Date of August 2023) (Town of Brookhaven 2023)	The Local Waterfront Revitalization Program will provide strategies and identify projects that improve public access, establish connections between downtown and the waterfront, modify local codes and ordinances to remove barriers to sustainable development, and incorporate sea level rise projections and resiliency measures into community planning.
Islip, Town of	None identified	The Town of Islip is in the process of creating a Comprehensive Plan.
Southampton, Town of	Town of Southampton Coastal Resources & Water Protection Plan (2016)	The plan describes the community's scenic resources as follows: "Southampton's unique scenic quality and sense of place is derived from the interplay of rural farmland, areas of undeveloped open space, water frontage (bay, ocean) and the hamlet centers. This rural character graces the Town with significant natural and historic resources. It is this quality that maintains the Town's vitality as a resort, second home and visitor attraction, as well as an attractive place to live and work." The Plan presents the different visual resources found within the town, including natural environments, built environments, historic vistas, and recognized areas of high scenic quality.
Nassau County, New York		
Nassau County	Nassau County Master Plan (2010)	The Nassau County Master Plan's goals are centered around a framework that helps shape the county's jobs, places, and infrastructure. Economic development is to be enhanced by strengthening downtowns, revitalizing underutilized commercial properties, and redeveloping brownfields to preserve the quality of life for residents by protecting environmental, scenic, and historic resources. Within the Master Plan, sections are dedicated to the importance of historic and cultural assets, along with the sustainable land use development and waterfront and coastal zones. The plan addresses the county's variety of historic, cultural, and scenic resources in addition to the environmental resources Nassau County has to offer.
Long Beach City	Comprehensive Plan 2022–2023 (draft)	The 2023 Comprehensive Plan outlines the city's values, visions, and goals for the next 15 years. One of the city's goals is to enhance the physical attributes of all commercial districts and areas. This includes improving aesthetics in streetscapes and commercial areas. Increasing public access to the waterfront is an important aspect to the Comprehensive Plan, along with the ability for beaches and dunes for the southern waterfront to provide resiliency, environmental, social, and economic benefits. However, no specific objectives are included in the plan for protecting or improving scenic views, or beach/waterfront views.
Hempstead, Town of	Energy and Sustainability Master	The implementation of a "green grounds" policy would promote greener and more cost-effective maintenance and operations strategies. This is important as the demand for high quality public-

Jurisdiction	Authority	Objectives
	Plan (Town of Hempstead 2012)	use landscapes has increased. The "green grounds" policy would not compromise the visual landscape quality. There is no town master plan or specifics discussed in the plan referenced about the preservation of scenic views.
Oyster Bay, Town of	Town of Oyster Bay: Open Space Preservation Plan (South Shore Estuary Reserve Workplan Implementation) (2010)	Scenic value is identified in the Open Space Preservation Plan as an important factor in identifying open space and resource protection.
State of New Jersey		
New Jersey Coastal Management Program	Section 309 Assessment and Strategy (2021-2025)	Section 309 Enhancement Objective: Attain increased opportunities for public access, considering current and future public access needs, to coastal areas of recreational, historical, aesthetic, ecological, or cultural value.
New Jersey Department of Environmental Protection	Green Acres Program (2023)	The mission of this program is "to achieve, in partnership with others, a system of interconnected open spaces, the protection of which will preserve and enhance New Jersey's natural environment and its historic, scenic, and recreational resources for public use and enjoyment."
State Historic Preservation Office	New Jersey State Register of Historic Places	The geographic analysis area contains additional historic resources that the state has determined are worthy of preservation, but which have either not been determined eligible for inclusion or have not been evaluated for listing in the NRHP.
Atlantic County, New Jersey		
Atlantic County	Atlantic County, New Jersey Master Plan (2018); Atlantic County, New Jersey Open Space and Recreation Plan (2018)	The Master Plan includes a goal to preserve and protect resources, environmentally sensitive areas, particularly watersheds, recharge areas, threatened and endangered species habitat, scenic view sheds, and other valuable features. The Pine Barrens Byway is located partially within the county and includes a variety of historic and scenic sites. There are no specific objectives to preserve and protect scenic views from within the community or the ocean/beach areas. The Open Space and Recreation Plan defines open space as consisting of "diverse environments such as forests, fields, meadows, lakes, ponds, beaches, rivers, streams, historic sites and structures, scenic views and corridors, athletic fields, gardens, orchards, farmland, and vacant lots." No specific objectives are included within the plan for protecting or improving scenic views, or beach/waterfront views.
Absecon, City of	2016 Reexamination Report (2017)	The need to develop and implement programs and regulatory controls to protect scenic resources is identified in the reexamination report, specifically pertaining to residential structures along the Shore Road Corridor and adjacent streets. The report introduces recommendations for historic preservation. No specific objectives are included within the report for protecting or improving scenic views, or beach/waterfront views.
Atlantic City	Atlantic City Master Plan (2008);	An objective under the Open Space and Recreation section of the Master Plan is to preserve and protect open space areas that have scenic views and/or important historical, cultural significance and

Jurisdiction	Authority	Objectives
	Master Plan Reexamination Report (2016)	exceptional ecological value. Gardner's Basin Maritime Park is identified as being the most scenic park in the city as it sits by the water's edge. The Conservation Element section describes tidal marshes to provide grand scenic views of the city's urban skyline due to the flat landscape character. Although areas are identified as being scenic, no specific objectives are included within the Master Plan for protecting or improving scenic views, or beach/waterfront views. The reexamination report does provide specifications.
Brigantine, City of	2016 Master Plan Re-examination Report (2016)	An objective identified from the previous planning documents includes an intent to "implement programs and regulatory controls designed to protect the scenic resources of the community." Zoning controls such as building height restrictions and setbacks have previously been implemented. There is public concern for access to scenic resources due to the development of the waterfront. There is a need to promote and preserve access to the Bay and Atlantic Ocean. A general goal to promote a desirable visual environment through creative development techniques and good civic design and arrangements is in the 2016 General Goals and Objectives Statement section. Provisions are made in subsequent sections to respond to this objective and improve the visual environment through changes to building setbacks, height restrictions, and similar measures. However, no additional measures are proposed to protect or enhance visual access, and protect scenic corridors.
Egg Harbor Township	Egg Harbor Township Master Plan (2002); Master Plan Reexamination Report (2017)	The Master Plan wants to provide resource protection by enhancing the natural, cultural and scenic resources of the Great Egg Harbor River (GEHR) and its watershed. The GEHR and its tributaries are described as a scenic resource with many scenic landscapes including lakes, streams, pristine forest areas, and cedar/hardwood swamps. The Pinelands Comprehensive Management Plan designates the lower and middle portions of the river and its tributaries as scenic corridors of "special significance" within the Pinelands. It identifies the need to incorporate resource protection measures and proposes the creation of a River Conservation (RC) overlay zoning district and the establishment of a land use plan that protects river resources. Recommendations for this zoning district include minimizing the visual impacts of development as seen from the river. The 2017 Reexamination Report has shown no progress in implementing the proposed RC zone overlay and is still a recommendation.
Galloway Township	Master Plan Reexamination Report (2020)	An objective identified from the previous planning documents is to preserve and protect open space areas having scenic views or important historical, cultural, or agricultural significance. Another identified objective is to maintain continuous networks of open spaces along streams, scenic areas, and critical environmental areas. However, no specific objectives are included within the Master Plan for protecting or improving scenic views, or beach/waterfront views.
Linwood City	City of Linwood Master Plan (2002);	The City of Linwood's goals include preserving the city's historic, scenic, and recreational assets. However, there is no specific

Jurisdiction	Authority	Objectives
	Master Plan Reexamination Report (2018)	mention of the preservation of outward views from within the community, or ocean/beach views. No specific objectives are included within the Master Plan for protecting or improving scenic views, or beach/waterfront views.
Longport, Borough	Municipal Public Access Plan (2020) (Borough of Longport 2020)	This plan lays out the visions for providing access to tidal waters and shorelines. There is no mention of visual or scenic resources; however, the importance for public water access is important in this Borough.
Margate City	2016 Comprehensive Master Plan Update (2017)	This Master Plan is in place to address the city's increased seasonal population by developing plans and strategies for the city to adapt and thrive in the future. One goal is to promote a desirable visual environment through creative development techniques and good civic design and arrangement. A second objective is to establish within the Land Use Plan and Land Development Ordinance, as appropriate, specific architectural design standards to promote a desirable visual environment and ensure the continued visual integrity of both the commercial and residential sections of the city. A goal set forth around waters includes minimizing pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state; protect public health; safeguard fish and aquatic life and scenic and ecological values; and enhance the domestic, municipal, recreational, industrial, and other uses of water.
Pleasantville City	Pleasantville Master Plan Reexamination (2015)	An objective of this plan is to create a conservation zone along the city's eastern boundary where the bay and marine tidal marsh exist so that development is not permittable. However, no specific objectives are included within the plan for protecting or improving scenic views, or beach/waterfront views.
Port Republic City	None identified	
Ventnor City	2016 Master Plan Reexamination (2016) (Ventnor City 2016)	No specific objectives are included within the plan for protecting or improving scenic views, or beach/waterfront views.
Burlington County, New Jersey		
Burlington County	Parks and Open Space Master Plan (2002)	An objective of this plan is to identify and preserve areas of significant scenic beauty. This includes roads that provide visual or physical access to extraordinary scenic, cultural, recreational, or natural features. These areas will be submitted to the New Jersey Department of Transportation for designation in accordance with the New Jersey Scenic Byways Program. The plan recommends that the county should work with appropriate staff and outside agencies to identify, map, and develop viewsheds and areas of significant beauty. As a part of the county's goal to advance the county's culture, character, and heritage through development of the county park system, the county plans to erect interpretative signs to promote historic viewsheds. No specific objectives are included for protecting or improving beach/waterfront views.
Bass River Township	None identified	

Jurisdiction	Authority	Objectives
Cape May County, New Jersey		
Cape May County	Cape May County Open Space and Recreation Plan (2007); Comprehensive Plan (2022)	One goal of the Cape May County Open Space and Recreation Plan is to protect and preserve natural and scenic resources. However, there are no specific objectives for protecting or improving scenic views, or beach/waterfront views. The Comprehensive Plan also does not include objectives for protecting or improving scenic views, or beach/waterfront views.
Ocean City	City of Ocean City Master Plan (1988); Ocean City Open Space & Recreation Plan (2014); Master Plan Reexamination Report (2019); Conservation Plan Element, Environmental Resources and Recreation Inventory (2009)	An objective of the Ocean City Master Plan is to promote a desirable visual environment through creative development techniques with respect to environmental assets and constraints of the overall city and of individual development sites. Another objective is to encourage the preservation and restoration of historically significant buildings and sites within the city. There are development provisions for structures in the waterfront neighborhoods of the city to preserve waterfront views. The Ocean City Open Space and Recreation Plan includes a conservation goal to preserve and maintain the ecological, historical, visual, recreational, and scenic resources of the city. The plan includes guidelines to acquire sites of special scenic value that should be protected to preserve or enhance the character of the community. The goal of the Conservation Plan Element, Environmental Resources and Recreation Inventory is to preserve and maintain the ecological, historic, visual, recreational, and scenic resources of the city. However, there are no objectives for protecting or improving scenic views, or beach/waterfront views. There are also no additional objectives in terms of scenic resources in the Master Plan Reexamination Report.
Monmouth County, New Jersey		
Monmouth County	The Monmouth County Master Plan (2016); 2018 Master Plan Reexamination (2018)	This plan's objectives are to help guide efforts and actions that contribute to a strong, stable, and sustainable prosperity through redevelopment, revitalization, and rediscovery. Relevant objectives of the plan include: • Protect, conserve, and enhance the county's significant, diverse, natural, and scenic resources utilizing sound ecological protection and restoration measures. • Support investment in the preservation of cultural, historic, and scenic resources located in priority growth areas and locations. • Support retention, preservation, restoration, and improvement of our cultural, historic, and scenic resources that define a community's distinct character. The Reexamination Plan does not mention any changes to the goals pertaining to scenic resources.
Allenhurst Borough	Master Plan Reexamination Report (2018)	The Master Plan references the Coastal Metropolitan Planning Area, within which the Borough falls. One of the objectives of this reference is to encourage the reclamation of environmentally damaged sites and mitigate future negative impacts, particularly for waterfronts, beaches, scenic vistas, and habitats. It also references the State Development and Redevelopment Plan (SDRP) goals, one of which is to preserve and enhance areas with historic, cultural, scenic, open space, and recreation value.

Jurisdiction	Authority	Objectives
Asbury Park City	Master Plan & Master Plan Reexamination Report (2017)	The Master Plan provides improvement to the lakes in the city that would enhance the public's enjoyment through aesthetic and environmentally healthy improvements of the water and surrounding areas. However, no specific provisions are included for protecting or enhancing the outward views from within the community, or beach/ocean views.
Avon-by-the-Sea Borough	Municipal Public Access Plan (2017)	This plan identifies the boardwalk as an important public access point that provides visual and physical access to the oceanfront. There are five locations along Shark River that are limited to visual access only due to safety concerns.
Belmar Borough	Master Plan Reexamination Report & Update (2016)	One of the four goals of this Master Plan is Preservation and Enhancement of Critical State Resources – Ensure that strategies for growth include preservation of the State's critical natural, agricultural, scenic, recreation, and historic resources, recognizing the roles they play in sustaining and improving the quality of life for New Jersey residents and attracting economic growth.
Bradley Beach Borough	Master Plan Reexamination Report (2018); Recreation, Open Space, and Conservation Element of the Bradley Beach Borough Master Plan; Municipal Public Access Plan (2019)	The Master Plan Reexamination Report addresses land development issues and provides recommendations where necessary. The Recreation, Open Space, and Conservation Plan objective is to provide an inventory of the Borough's existing recreation, open space, and observation facilities and establish goals and objectives to guide enhancement, preservation, and development of these facilities. The Municipal Public Access Plan includes the enhancement of public access to tidal waters and shorelines for recreation, navigation, commerce, and fishing. Recreation activities in this Borough include swimming, sunbathing, fishing, surfing, sport diving, bird watching, walking, and boating along the tidal shores. No specific objectives are included within the three plans for protecting or improving scenic views, or beach/waterfront views.
Deal Borough	Municipal Public Access Plan (2017)	This plan not only identifies physical beach access areas in the Borough, but visual access of the beach and ocean for those who choose not to physically access the beaches. Three points of visual access are identified.
Highlands Borough	2016 Master Plan Reexamination Report and Master Plan Amendments (2016)	This plan recognizes the importance of aesthetics in terms of new building and landscape design, streetscapes, and neighborhoods. The land use plan elements include open space preservation and living shorelines. No specific objectives are included within the plan for protecting or improving scenic views, or beach/waterfront views.
Loch Arbour Village	Municipal Public Access Plan (2017)	The Village is responsible for providing public access to the tidal waters. No specific objectives are included within the Access Plan for protecting or improving scenic views, or beach/waterfront views.
Long Branch City	2020 Master Plan Reexamination (2020) Municipal Public Access Plan (2017)	Some goals in the Master Plan include promoting aesthetically pleasing development that recognizes the character of the traditional New Jersey shore towns, preserving the city's natural resources and historically and architecturally significant districts and structures.

Jurisdiction	Authority	Objectives
		In the Municipal Public Access Plan, the city supports the reconstruction of the historic Long Branch Pier as a multi-purpose facility. This pier will be open for public use and includes a fishing area, a garden, a children's play area, visual access, and proximity to beach and boardwalk access points. There are 27 public access locations identified as having visual access. Between these two plans, no specific objectives are included for protecting or improving scenic views, or beach/waterfront views.
Manasquan Borough	Master Plan Re-examination (2017)	This plan encourages the development of both active and passive recreation for residents and visitors while maintaining the sensitivity to environmental and cultural resources. No specific objectives are included within the plan for protecting or improving scenic views, or beach/waterfront views.
Middletown Township	Master Plan Reexamination Report & Amended Housing Master Plan Element and Open Space, Recreation and Conservation Master Plan Element	This report discusses the approach to site design that promotes preservation of significant resources, including scenic corridors, historic roadways, architecturally and historically significant structures, and open space. No specific objectives are included within the plan for protecting or improving scenic views, or beach/waterfront views.
Monmouth Beach Borough	Municipal Public Access Plan (2017); Master Plan Reexamination Report and Plan Amendment (2017)	The plan identifies 13 publicly accessible areas that are for visual purposes only of the water. The plan is consistent with Goal #2 of the Monmouth County Comprehensive Master Plan, including to protect, conserve, and enhance the county's significant, diverse, natural, and scenic resources utilizing sound ecological protection and restoration measures. One of the report goals is to promote aesthetically pleasing human scale development that recognizes the character of traditional New Jersey shore towns. No specific objectives are included within the plan or the report for protecting or improving scenic views, or beach/waterfront views.
Neptune Township	The Township of Neptune Comprehensive Master Plan (2011)	The Master Plan provides a framework for development and preservation of the township throughout its scenic, historic, and natural areas. The plan provides goals and recommendations for future development while preserving natural and historic resources. This includes promoting aesthetics in terms of commercial and industrial areas, future utility installations, and the visual quality of scenic corridors. The Fletcher Lake and Wesley Lake corridors will be evaluated for potential designation as scenic corridors and to consider adopting appropriate design standards and guidelines for development along designated corridors. However, no specific objectives are included for protecting or improving beach/waterfront views.
Sea Bright Borough	2017 Sea Bright Borough Master Plan (2017)	This plan notes the importance in conserving the beach and river waterfronts for the value of providing both scenic vistas and recreational opportunities. A policy of the Borough includes promoting visual environment through creative development techniques and good civic design and arrangement.
Sea Girt Borough	Master Plan Reexamination Report (2018)	The Master Plan states the Coastal Area Facilities Review Act policies, including the reclamation of environmentally damaged sites and mitigation of future negative impacts, particularly for

Jurisdiction	Authority	Objectives
		waterfronts, beaches, scenic vistas, and habitats. The plan discusses the need for a historic preservation plan. No specific objectives are included for protecting or improving scenic views, or beach/waterfront views.
Spring Lake Borough	Master Plan (2010)	Some of the goals presented in the Master Plan include maintaining historic resources and the natural beauty of the Borough, enhancing conservation, recreational, and open spaces. No specific objectives are included for protecting or improving scenic views, or beach/waterfront views.
Ocean County, New Jersey		
Ocean County	Conservation Plan Element, Environmental Resources and Recreation Inventory (2009); 2011 Comprehensive Master Plan (2011); Open Space, Parks & Recreation Plan (2020)	The Conservation Plan Element's overall goal is to preserve and maintain the ecological, historic, visual, recreational, and scenic resources of the city. However, there are no objectives for protecting or improving scenic views, or beach/waterfront views. The Comprehensive Master Plan and the Open Space, Parks, and Recreation Plan include no objectives for protecting or improving scenic views, or beach/waterfront views.
Barnegat Light Borough	Barnegat Light Borough Master Plan Reexamination (2018)	One goal of the Municipal Public Access Plan (attached to the Master Plan) is to maintain and continue to promote a visually pleasing aesthetic along the waterfront areas. The plan identifies four public access points that are used for visual access only.
Barnegat Township	2011 Barnegat Township Master Plan (2011)	Historic preservation is a valuable asset to the community. By protecting aesthetically attractive architectural elements and utilizing existing infrastructure, historic preservation is essential. Significant sites are often those that already provide the town with open space, recreation, and scenic vistas. Referencing the State Development and Redevelopment Plan, the Borough will preserve and enhance historic, cultural, scenic, open space, and recreational value. However, no specific objectives are included within the plan for protecting or improving scenic views, or beach/waterfront views.
Bay Head Borough	Municipal Public Access Plan (2020); Master Plan Reexamination Report and Update (2021)	There are 22 public access points identified as having visual access to the water in the Municipal Public Access Plan. There are no specific objectives in the plan for protecting or improving scenic views, or beach/waterfront views.
Beach Haven Borough	Beach Haven Borough Comprehensive Master Plan (2018)	A goal of the Comprehensive Master Plan is to maintain and continue to promote a visually pleasing aesthetic along the waterfront areas. However, there are no specific objectives included for protecting or improving scenic views, or beach/waterfront views.
Berkeley Township	Berkeley Township Comprehensive Master Plan (1997)	The Township Master Plan, the Reexamination Report, and the Township Environmental Resources Inventory include no specific objectives for protecting or improving scenic views, or beach/waterfront views.

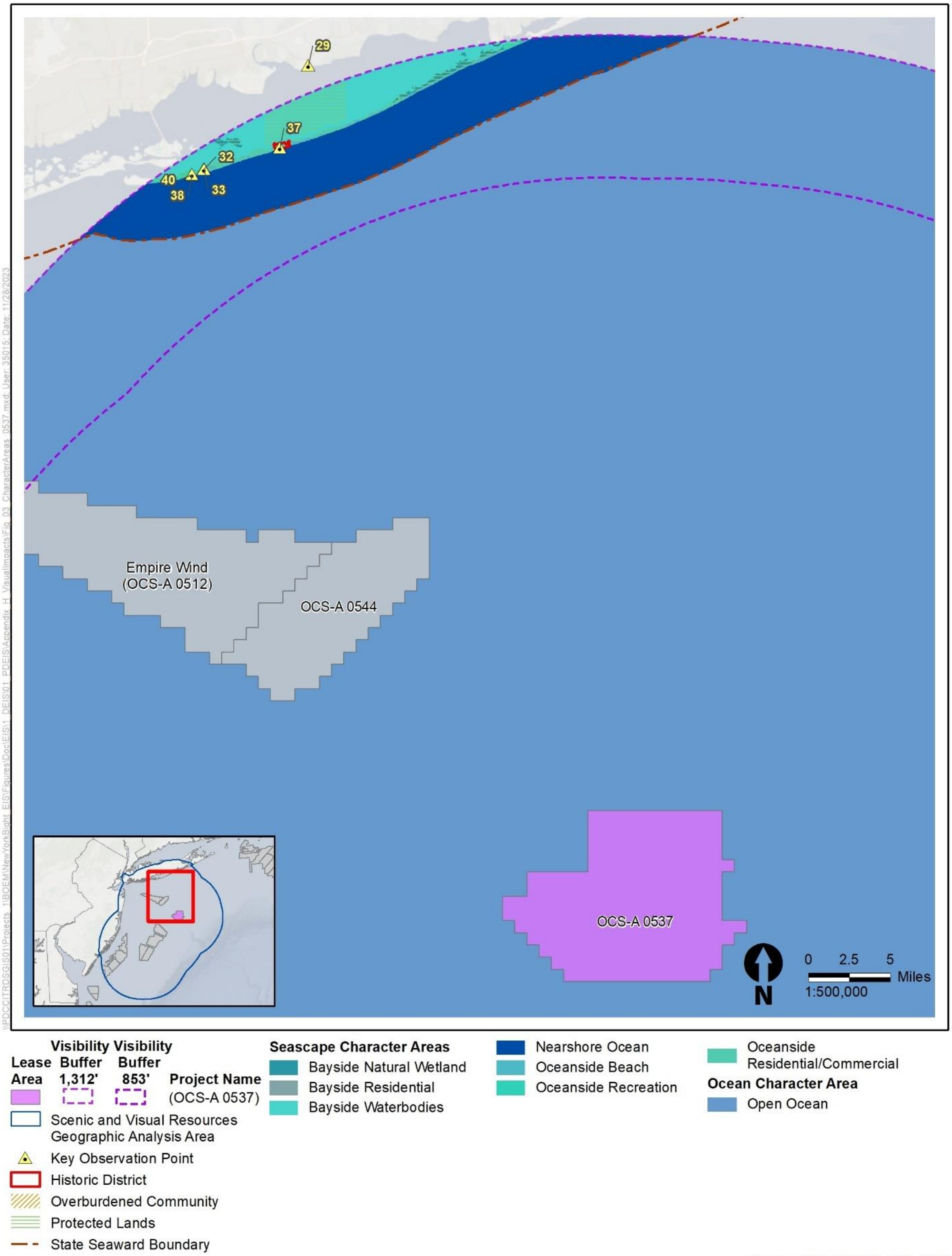
Jurisdiction	Authority	Objectives
	General Reexamination of the Master Plan (2019) Environmental Resources Inventory (2012)	
Brick Township	Master Plan Reexamination Report (2018) Master Plan: Part 2 – Land Use Element	In the Land Use Element of the Master Plan, there is recognition of the special attraction and scenic value placed on the residential uses of a barrier island location and the over-water views it provides. However, no specific provisions for protecting or enhancing the outward views from within the community, or beach/ocean views are included. The Master Plan Reexamination Report includes no specific objectives for protecting or improving scenic views, or beach/waterfront views.
Eagleswood Township	None Identified	
Harvey Cedars Borough	Municipal Public Access Plan (2017)	A goal of the Municipal Public Access Plan is to maintain and continue to promote a visually pleasing aesthetic along waterfront areas. There are 21 publicly accessible areas listed as having visual access to the waterfront.
Lacey Township	Master Plan (1991) Lacey Township Master Plan Update – Revised Land Use Element (2016); Master Plan Reexamination Report (2018)	The Township Master Plan includes a townscape objective that states that all elements that could be obtrusive to the boating public should be reviewed and specifically addressed through view studies or simulations prior to receiving approvals. The Township Reexamination Report and Revised Land Use Element include no specific objectives for protecting or improving scenic views, or beach/waterfront views.
Lavallette Borough	Master Plan Reexamination (2006); Master Plan for the New Millennium (1999)	The Reexamination of the Master Plan encourages the preservation and maintenance of Lavallette's historic sites. The original Master Plan encourages the importance of aesthetic streetscapes, commercial land uses, and historical and cultural qualities. However, neither plan includes specific objectives for protecting or improving scenic views, or beach/waterfront views.
Little Egg Harbor Township	Reexamination Report and Master Plan Amendment (2015)	The Township Master Plan includes a goal to promote a desirable visual environment through conservation and preservation of valuable natural features. However, the plan does not include specific objectives for protecting or improving scenic views, or beach/waterfront views.
Long Beach Township	Comprehensive Master Plan Update (2017)	The Comprehensive Master Plan does not include specific objectives for protecting or improving scenic views, or beach/waterfront views.
Mantoloking Borough	2017 Master Plan Re-Examination Report (2017)	The Master Plan does not include specific objectives for protecting or improving scenic views, or beach/waterfront views.
Ocean Township	Ocean Township Master Plan (1990); 2019 Master Plan Reexamination Report (2019)	The Ocean Township Master Plan includes a conservation goal to identify scenic areas within the Township and provide for their preservation. The Reexamination Report includes no specific objectives for protecting or improving scenic views, or beach/waterfront views.

Jurisdiction	Authority	Objectives
Point Pleasant Beach Borough	2021 Reexamination & Master Plan Amendment	One plan objective is to strive to foster an aesthetically pleasing downtown commercial district for the ease and safety of pedestrians. This includes protecting and enhancing the historic maritime character of the Borough by maintaining appropriate scales of development intensity of use, and architectural style. However, it does not include specific objectives for protecting or improving scenic views, or beach/waterfront views.
Seaside Heights Borough	Master Plan Reexamination Report (2022); Vision Plan (2009)	The Vision Plan recognized the need for increased access to the bay front. However, neither plan includes objectives for protecting or improving scenic views, or beach/waterfront views.
Seaside Park Borough	2008 Seaside Park Master Plan (2008)	Although a goal of the Master Plan is to encourage desirable visual design of new and upgraded businesses, it does not include specific provisions for protecting or enhancing the outward views from within the community, or beach/ocean views. Standards for preservation of historic structures are included.
Ship Bottom Borough	2021 Master Plan Reexamination Report (2021)	This report prioritizes the value of public access to the waterfront and the importance of a sustainable shoreline void of erosion. However, it does not include specific objectives for protecting or improving scenic views, or beach/waterfront views.
Stafford Township	2017 Master Plan: Land Use Element (2017)	The Land Use Element of the Master Plan does not include specific objectives for protecting or improving scenic views, or beach/waterfront views.
Surf City Borough	Comprehensive Master Plan Re-examination (2019)	This Master Plan Re-examination highlights the need to prioritize the value of public access to the waterfront and the importance of a sustainable shoreline void of erosion, especially being a barrier island community. The municipal Public Access Plan, attached to the Re-examination, works to maintain and promote visually pleasing aesthetic waterfront areas. However, neither plan includes specific objectives for protecting or improving scenic views, or beach/waterfront views.
Toms River Township	Natural Resources Inventory (2016) Township of Toms River Master Plan (2017)	No specific objectives are included within the Natural Resources Inventory or the Master Plan for protecting or improving scenic views, or beach/waterfront views.
Tuckerton Borough	Master Plan (2002)	An objective in the Master Plan is to preserve and protect the distinctive physical and historic character of the Borough, and preserve maritime heritage by recognizing the ties to Tuckerton Creek, Little Egg Harbor, and the Atlantic Ocean. The Conservation Plan Element states that the protection of scenic visual corridors is valued as an important contribution to the quality of life for residents and should be protected from inappropriate development. These visual corridors are the view of Lake Pohatcong from Route 9, the view of Long Beach Island and Little Egg Harbor from the Tuckerton Cover area, and views of Tuckerton Creek.

H.3 SLVIA Results

This section presents the results of the SLVIA analysis, organized by SLIA (Section H.3.1) and VIA (Section H.3.2) results. The results are applicable to both action alternatives analyzed in the Draft PEIS, Alternative B and Alternative C, unless otherwise specified.

Visual simulations from representative viewpoints (available on BOEM's NY Bight website: https://www.boem.gov/renewable-energy/state-activities/new-york-bight) indicate that daytime and nighttime visibility of wind turbines and offshore substations would be noticeable to the casual observer from the open ocean character area, seascape character areas, landscape character areas, and viewer viewpoints. Figure H-2 through Figure H-7 show character areas with KOPs, sensitive resource areas (e.g., overburdened communities, protected natural landscapes, and historic areas), and visibility buffers for the 1,312-foot (400-meter) and 853-foot (260-meter) wind turbines. The visibility buffers for the two turbine heights are based on the rotor blade tip height and the parameters for the digital elevation model (DEM) and the digital surface model (DSM) using best practices recommended by ESRI (refer to Argonne 2024 for more information regarding viewshed modeling). Figure H-8 through Figure H-13 show the extent of onshore visibility for each lease area and both turbine heights based on viewshed modeling along with KOPs and sensitive resources. Sensitive resources are defined as overburdened communities, protected lands, and publicly accessible cultural and historic sites (refer to Argonne 2024 for more information on these resources).



Source: BOEM 2022, ANL 2023.

Figure H-2. Scenic resources and character areas for OCS-A 0537

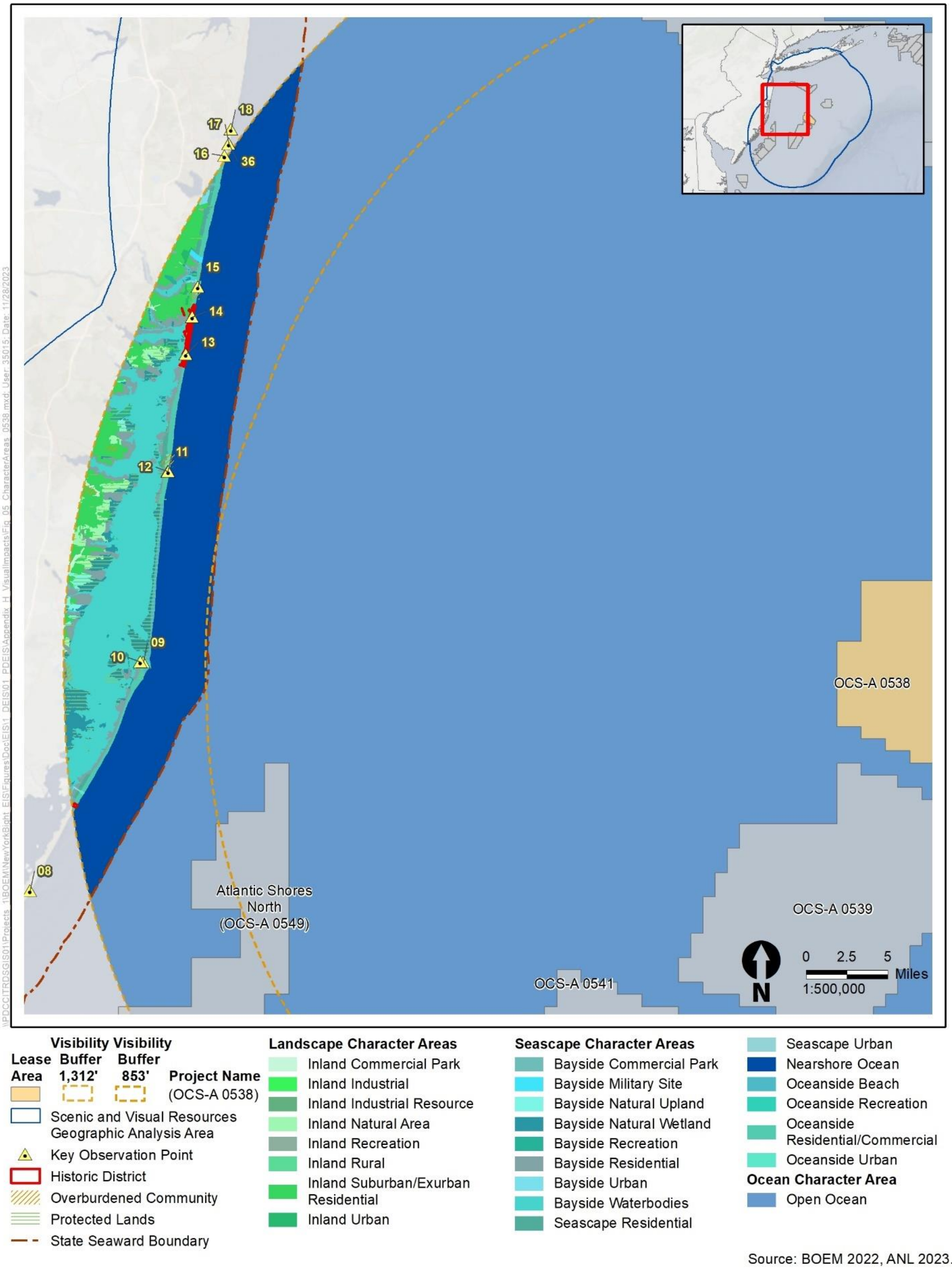


Figure H-3. Scenic resources and character areas for OCS-A 0538

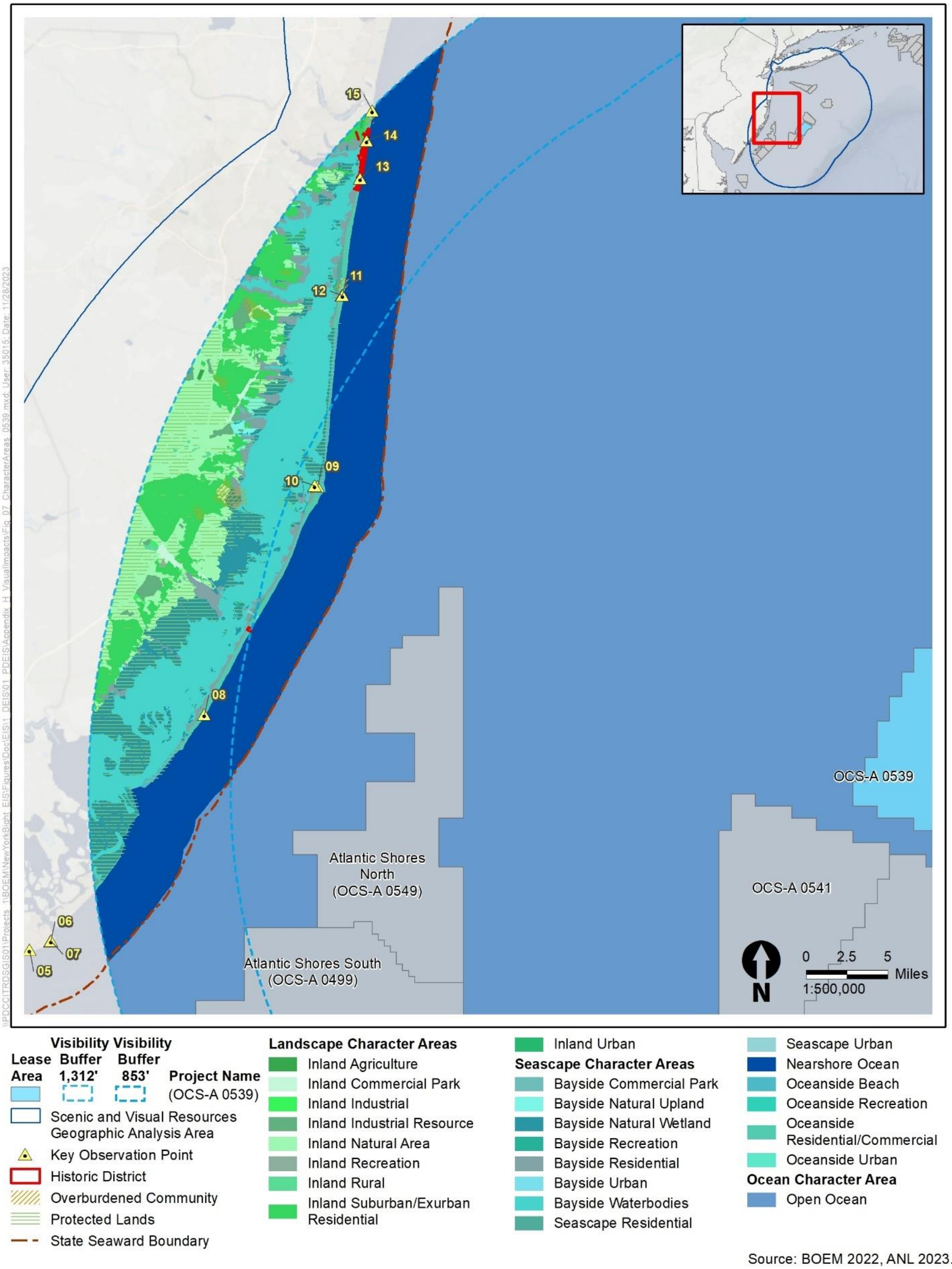


Figure H-4. Scenic resources and character areas for OCS-A 0539

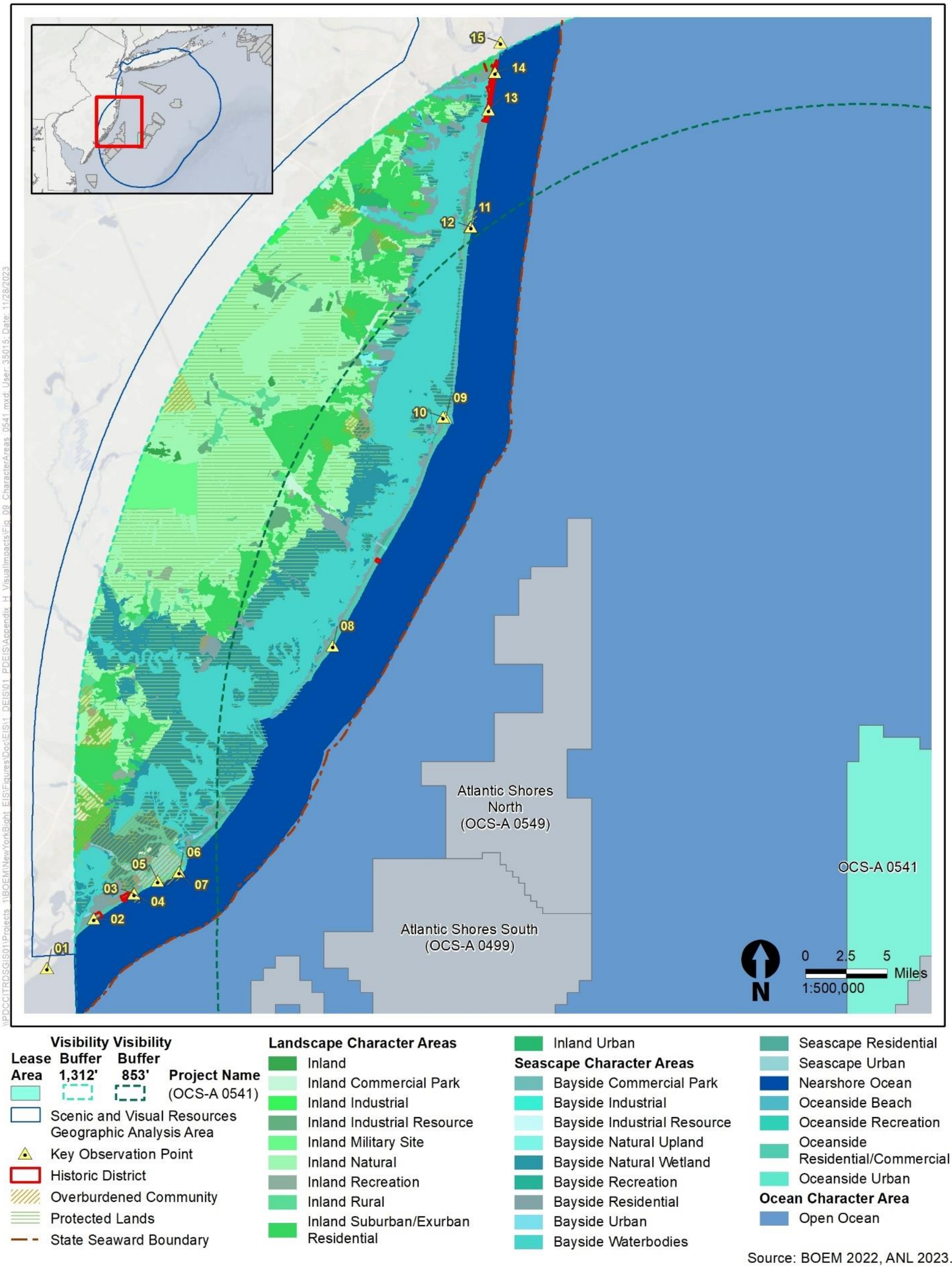


Figure H-5. Scenic resources and character areas for OCS-A 0541

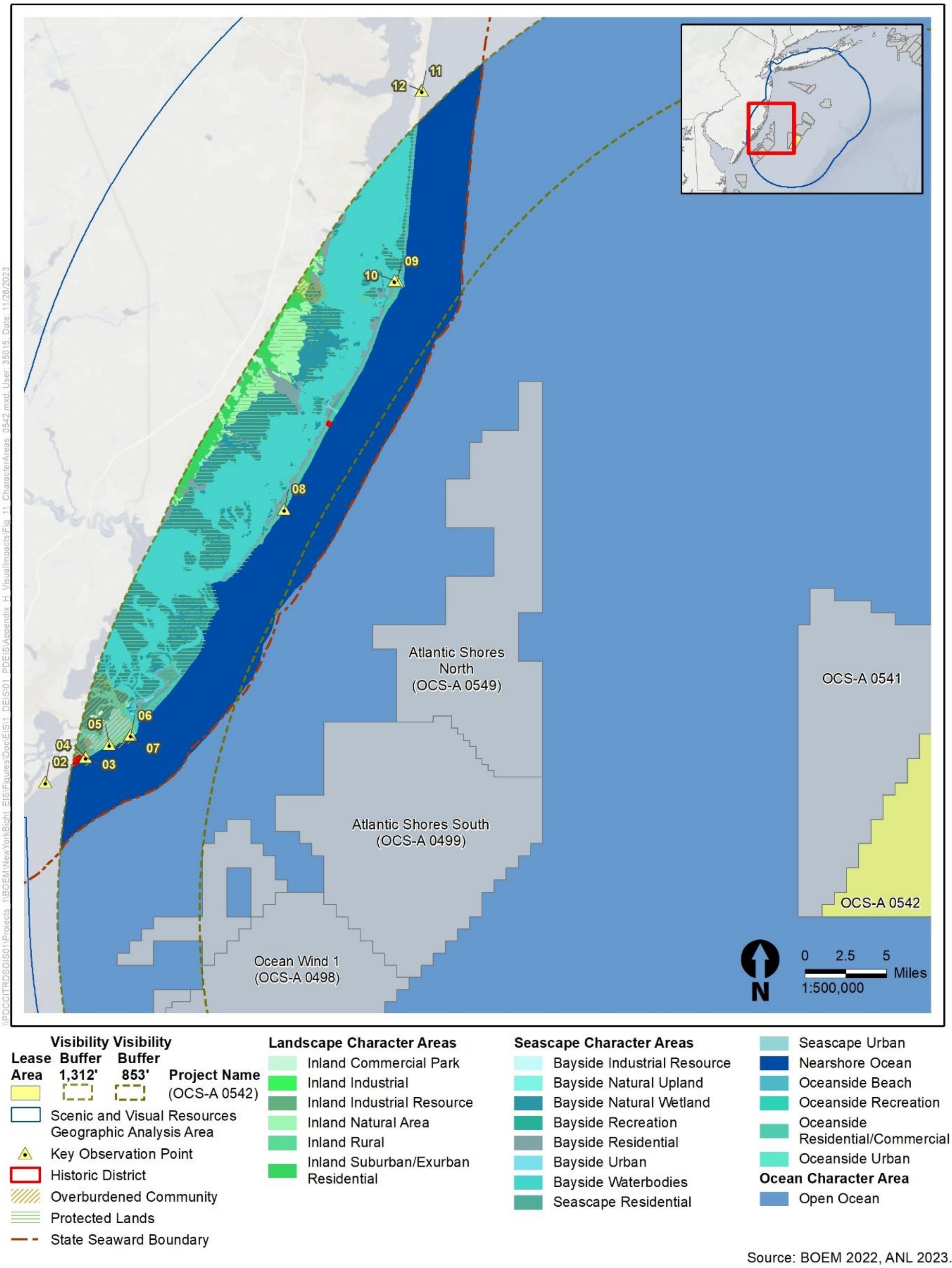


Figure H-6. Scenic resources and character areas for OCS-A 0542

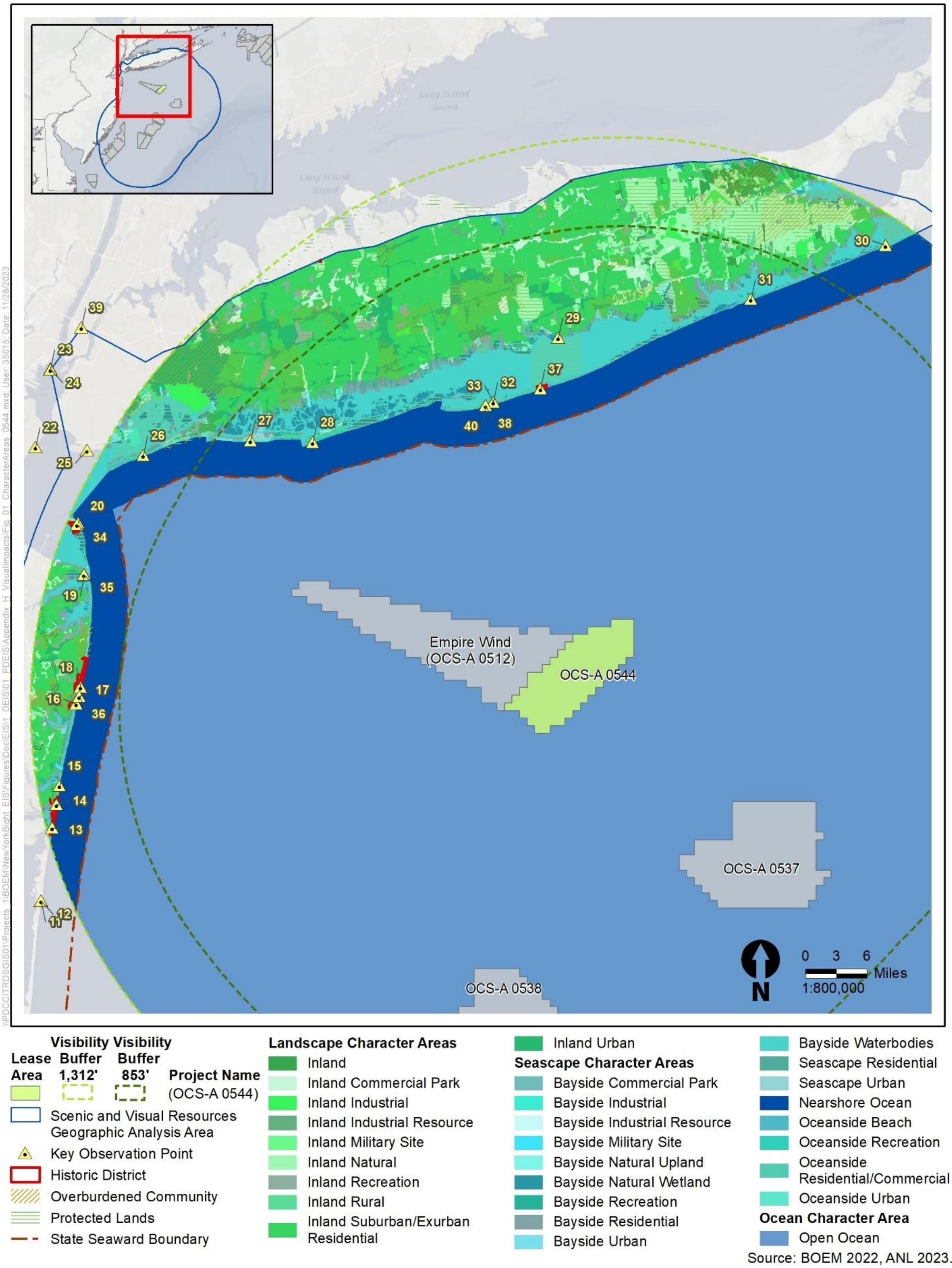
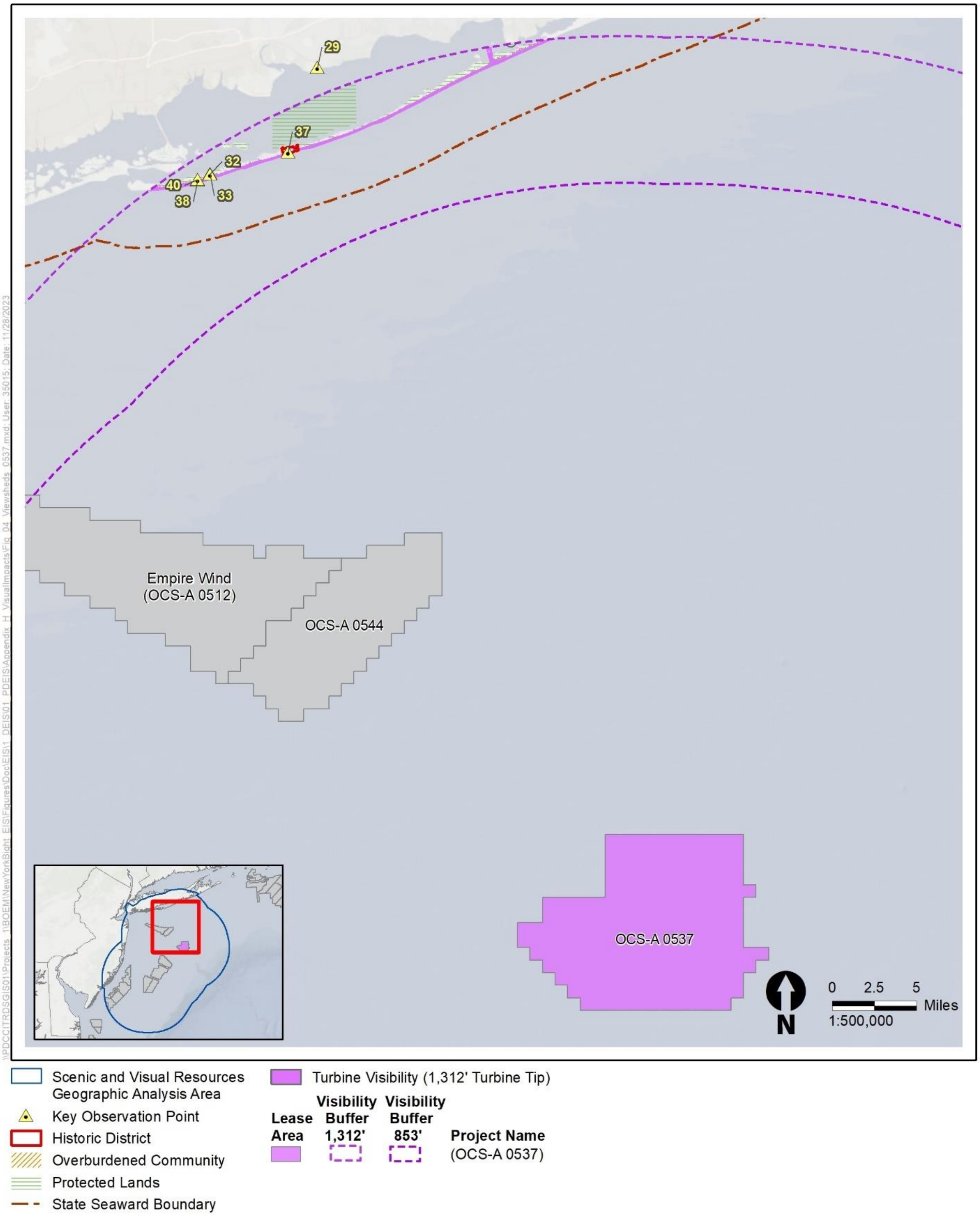
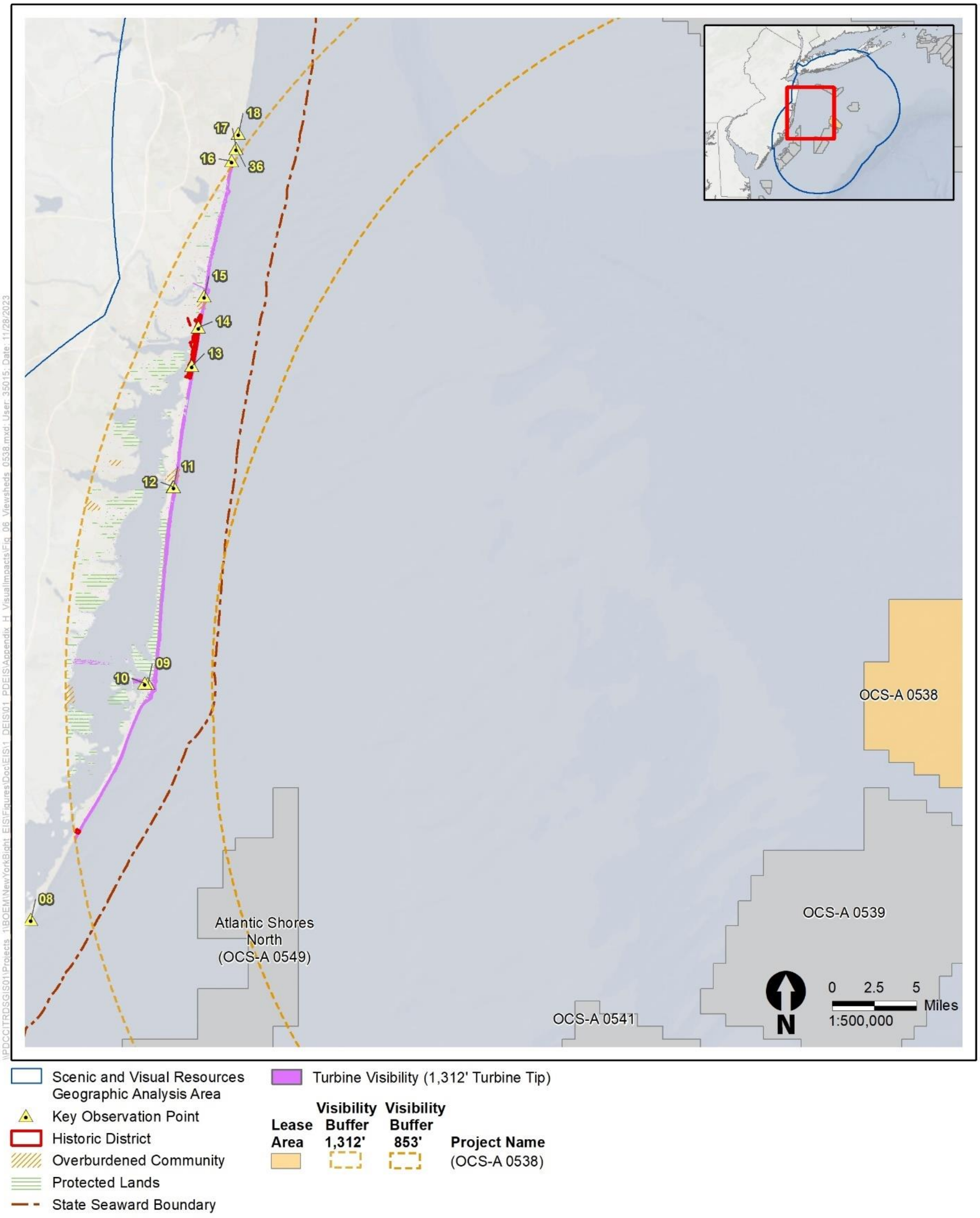


Figure H-7. Scenic resources and character areas for OCS-A 0544



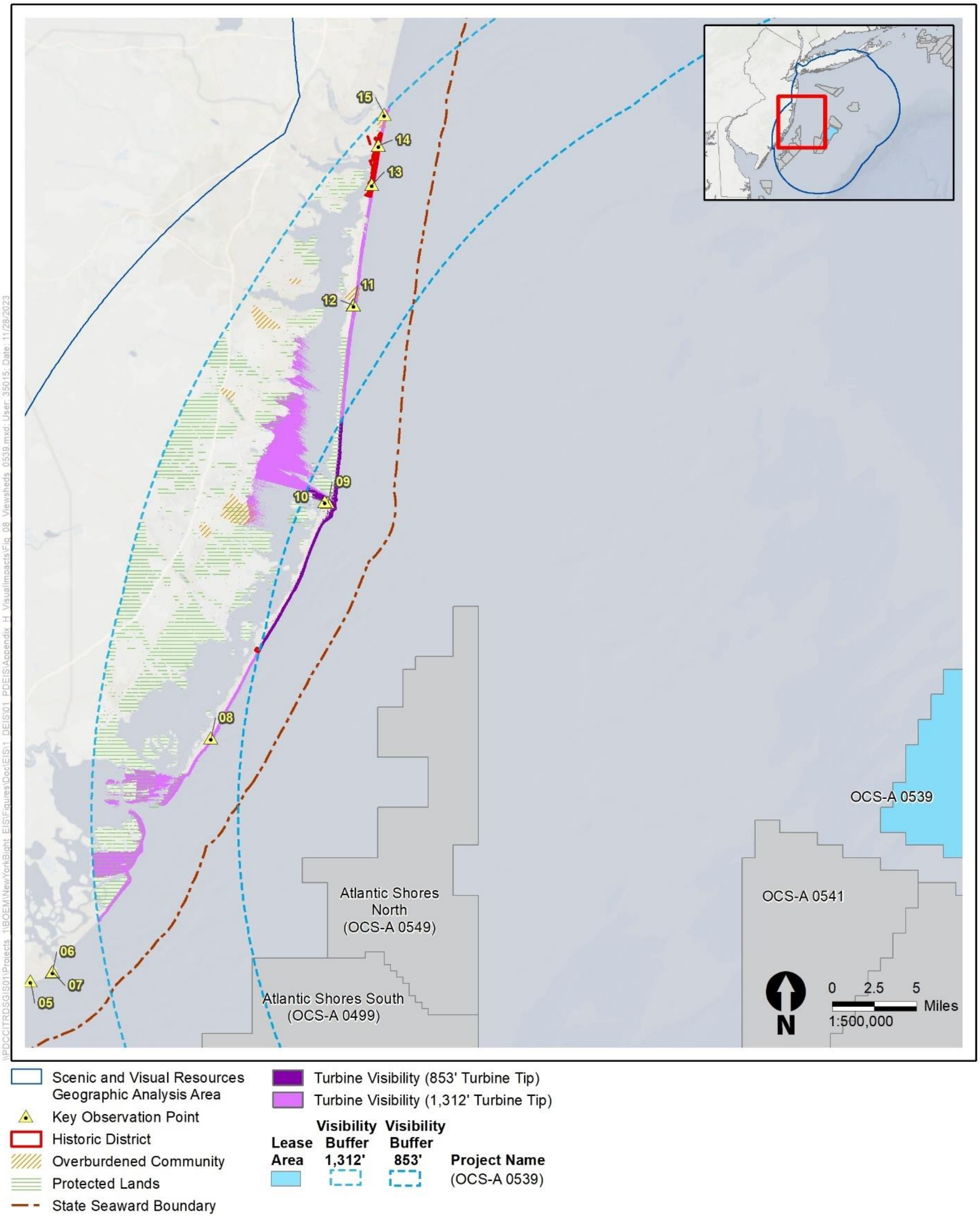
Source: BOEM 2022, ANL 2023.

Figure H-8. Turbine visibility viewshed and KOPs for OCS-A 0537



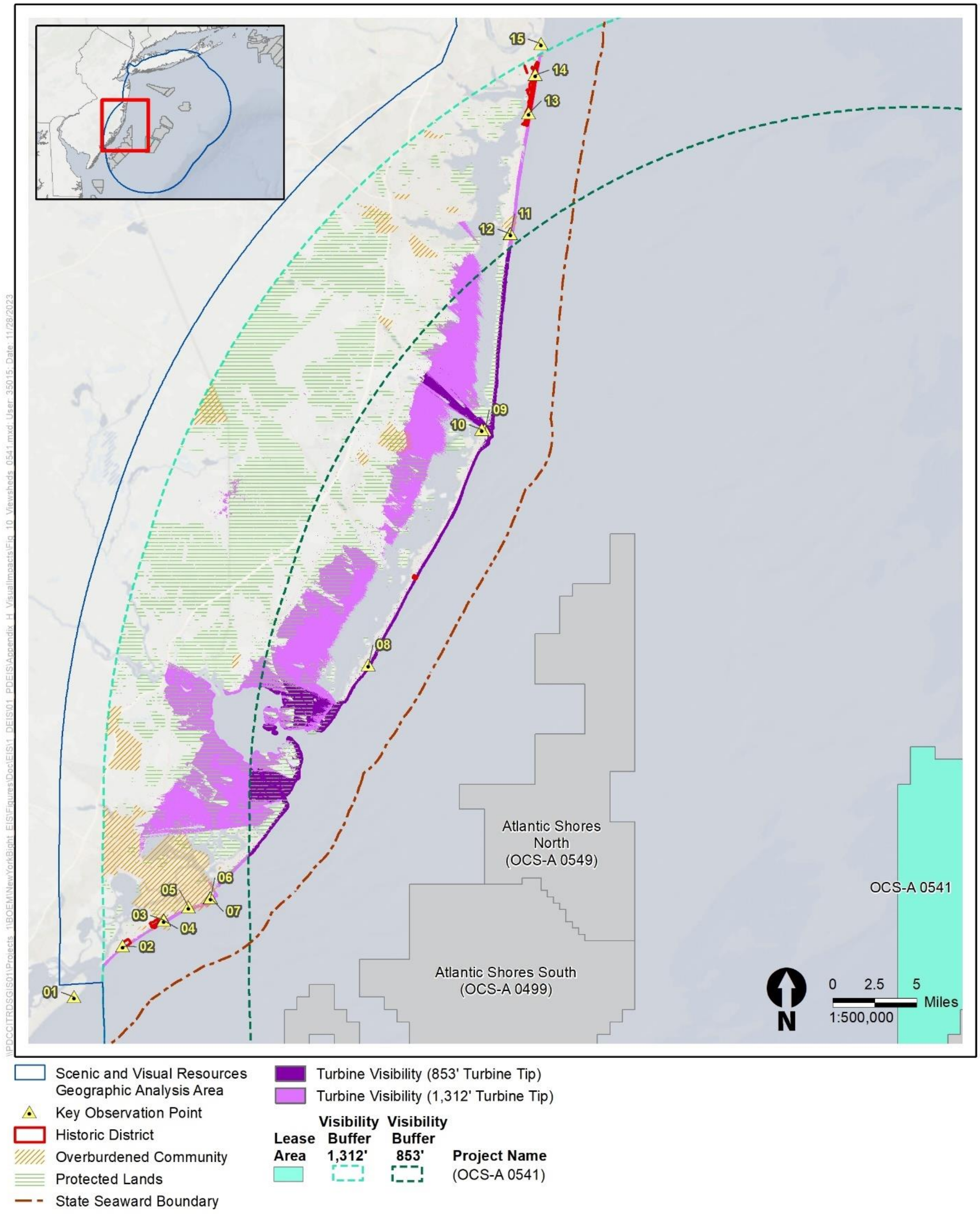
Source: BOEM 2022, ANL 2023.

Figure H-9. Turbine visibility viewshed and KOPs for OCS-A 0538



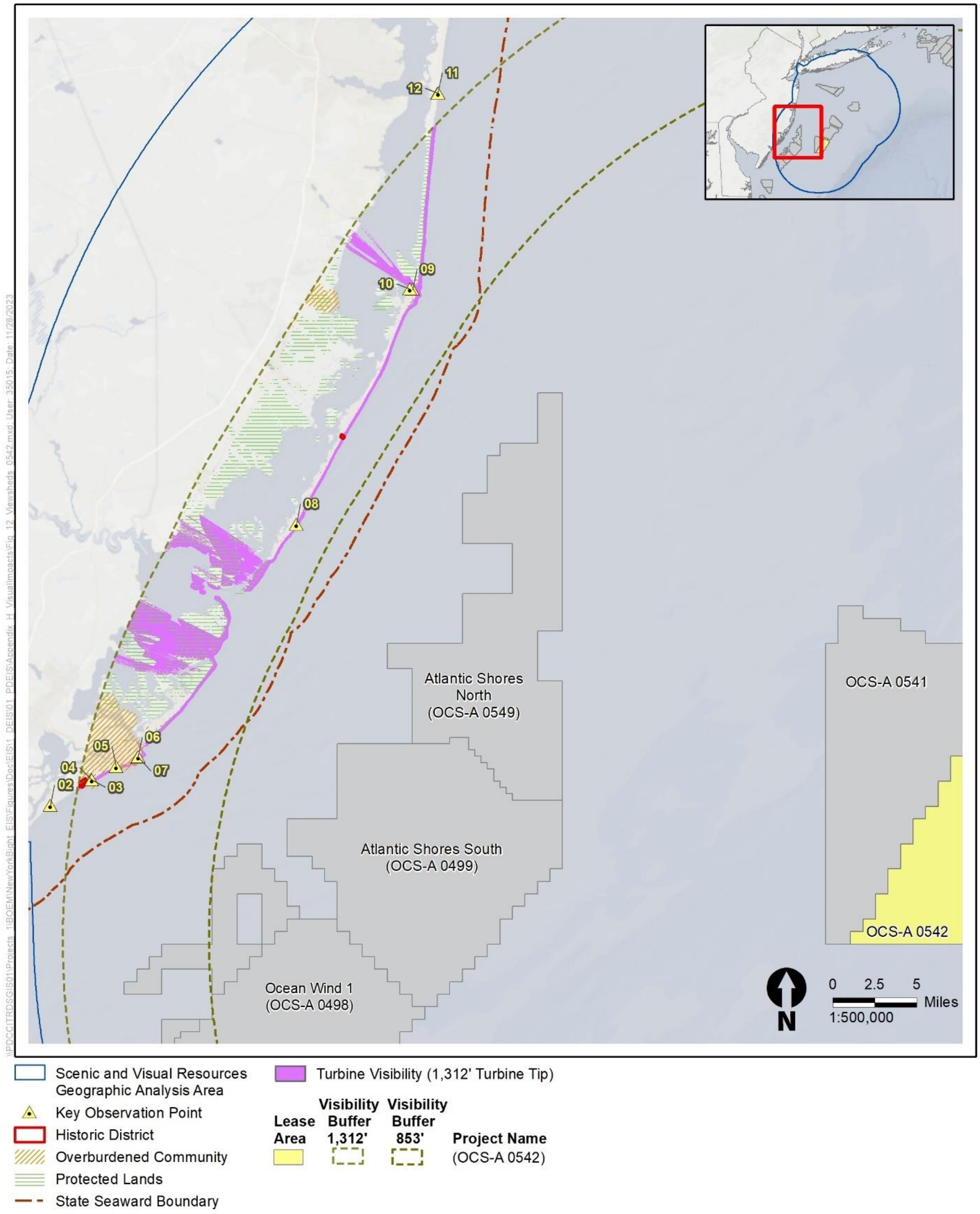
Source: BOEM 2022, ANL 2023.

Figure H-10. Turbine visibility viewshed and KOPs for OCS-A 0539



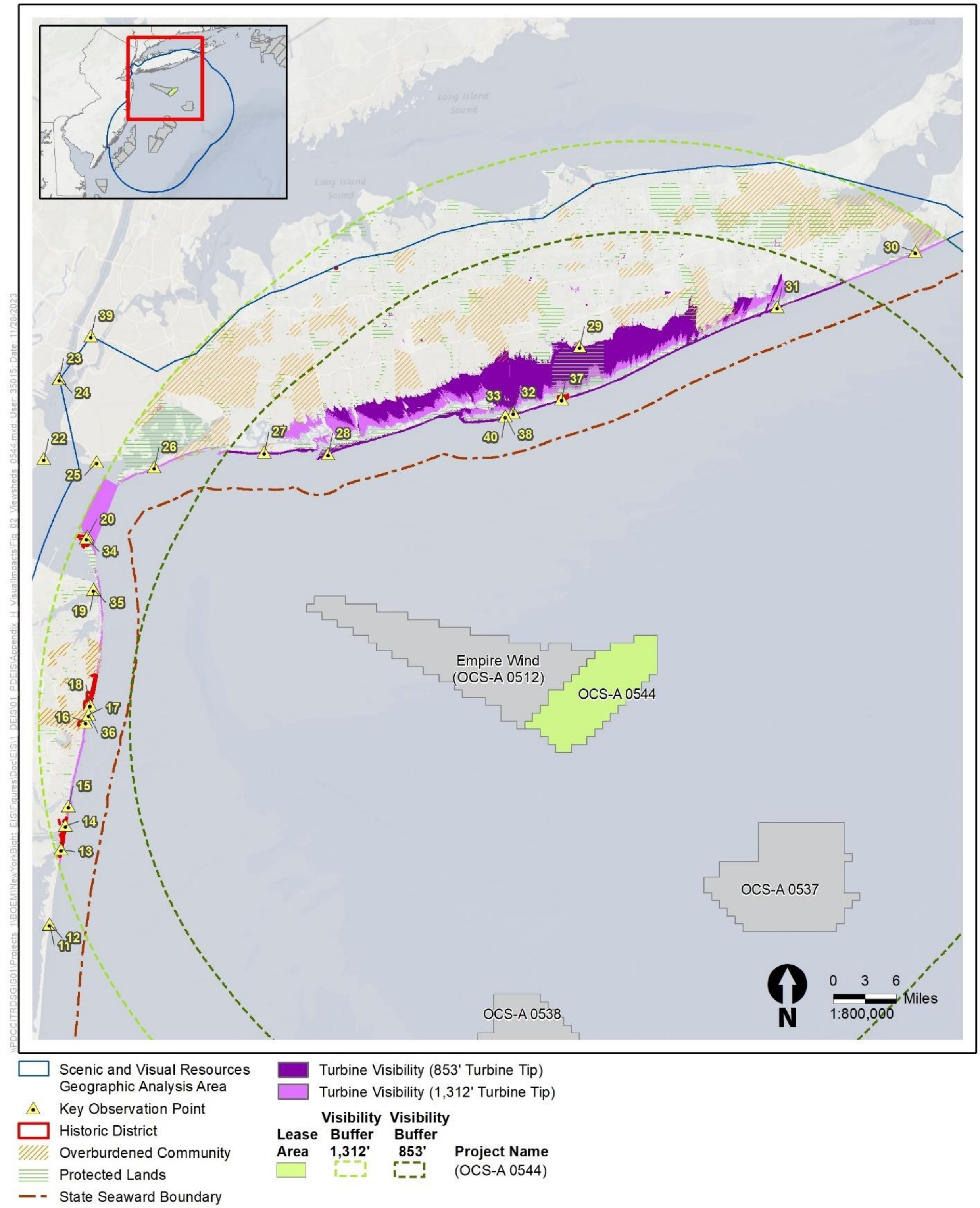
Source: BOEM 2022, ANL 2023.

Figure H-11. Turbine visibility viewshed and KOPs for OCS-A 0541



Source: BOEM 2022, ANL 2023.

Figure H-12. Turbine visibility viewshed and KOPs for OCS-A 0542



Source: BOEM 2022, ANL 2023.

Figure H-13. Turbine visibility viewshed and KOPs for OCS-A 0544

H.3.1 Open Ocean, Seascape, and Landscape Impact Assessment (SLIA)

H.3.1.1 Offshore Open Ocean, Seascape, and Landscape Character

Open ocean, seascape, and landscape character in the geographic analysis area is organized in a three-level hierarchy (Argonne 2024):

- **Level 1:** Defines the broad character of ocean, seascape, and landscape.
- **Level 2:** Character types are relatively homogeneous in character. They are generic in nature and share similar combinations of geology, topography, drainage patterns, vegetation, historical land use and settlement patterns, and perceptual and aesthetic attributes. Level 2 is specific to the seascape character, which is split into two discrete character types: those that maintain visibility to the ocean (oceanside seascape) and those that maintain visibility to the bay (bayside seascape). If both elements are visible, the discrete area is considered part of the oceanside seascape character area. Level 2 is not represented in ocean or landscape character, only in seascape.
- **Level 3:** Level 3 focuses on the aesthetic, perceptual, and experiential aspects of a character area (or type) with unique qualities that contribute to a sense of place. Within Level 3, character areas (or types) are further broken down into specific areas with common character and perceptual attributes. For example, these areas may have similar architectural styles, scale, development patterns, or other similarities that are identified and described for their unique qualities.

Table H-11 identifies the characters, character types, and character areas delineated in the geographic analysis area.

Table H-11. Summary of character (level 1), character types (level 2), and character areas (level 3)

Level 1: Characters	Level 2: Character Types	Level 3: Character Areas
Ocean Character	N/A	Open Ocean
Seascape Character	Bayside	Bayside Commercial Park
		Bayside Industrial
		Bayside Industrial Resource
		Bayside Military Site
		Bayside Natural Area Upland
		Bayside Natural Area Wetland
		Bayside Recreation
		Bayside Residential
		Bayside Urban
		Bayside Waterbodies
		Seascape Residential
		Seascape Urban
	Oceanside	Nearshore Ocean
		Oceanside Beach

Level 1: Characters	Level 2: Character Types	Level 3: Character Areas
		Oceanside Recreation
		Oceanside Residential/Commercial
		Oceanside Urban
Landscape Character	N/A	Inland Agriculture
		Inland Commercial Park
		Inland Industrial
		Inland Industrial Resource
		Inland Military Site
		Inland Natural Area
		Inland Recreation
		Inland Rural
		Inland Suburban/Exurban Residential
		Inland Urban

Source: Argonne 2024.

The following subsections include a description of each character, character type, and character area. Detailed descriptions and photographs of the character areas can be found in Argonne (2024).

H.3.1.1.1 Open Ocean Character

The Open Ocean zone includes the open water of the Atlantic Ocean off the coast of New Jersey and New York and portions of Delaware Bay. This character area's defining characteristic is the presence of open water as a dominant element and unobstructed views in all directions. This primarily includes open waters of the Atlantic Ocean that are 3 nm (5.5 kilometers) beyond the Atlantic shoreline and unbounded by landforms. Human elements, such as ships of various sizes, lighthouses, buoys, and other infrastructure, can be seen at various distances throughout the study area, but the emphasis of the view is consistently on the overall flatness and variable colors of the water.

H.3.1.1.2 Seascape Character Descriptions

The regions that comprise the seascape character type are unified by a view of and relationship to the ocean and other saltwater bodies such as bays, inlets, and sounds, extending 3 nm (5.5 kilometers) from the edge of the ocean's coastline into the ocean. These unified areas include bayside and oceanside features, as they are deeply connected visually, ecologically, and recreationally to each other. The land uses in seascape areas may vary significantly, but the emphasis on the connectivity between the land and ocean remains an important visual and experiential element across all areas with seascape character.

Bayside Seascape Types maintain a view and direct connection to bays and other related saltwater bodies and associated features such as marinas and other developments along the bay and related waterbodies. These areas, however, do not maintain a direct connection to the coastline or ocean itself.

Bayside Commercial Park

These areas reflect business districts and commercial areas composed of office complexes, big box stores, strip malls, and parking lots. Relatively few residential spaces exist within these landscapes. Buildings are nondescript, often single-story, but may also contain office complexes several stories tall. Major roads and highways may have such office parks and strip malls running alongside them, but these character areas are specifically delineated when the density of such development is significant. While non-ocean waterbodies may be visible from the premises, little to no infrastructure or general design of the space and the buildings themselves emphasize the view of the waterbodies.

Bayside Commercial Parks have low sensitivity. Their blocky, nondescript built features cause low susceptibility to changes in their character, and the low scenic quality of commercial parks contributes to the low value associated with the character of these areas. This character area occurs along the coast of Brooklyn, within Gravesend Bay.

Bayside Industrial

Bayside Industrial areas are adjacent to the bay or other bayside waterbody and are industrial in nature, with features such as smokestacks, large blocky buildings, docks, large freight ships, bare earth, concrete, waste pilings, metal silos, warehouses, cranes, vehicles, and industrial materials. The scale of the industrial infrastructure is typically large, with angular, geometric cranes lining the waterfront. Freighters and other large coastal ships move within this environment, adding an additional visual weight and blocky pattern. While they are sometimes connected to residential and urban areas, they typically lack public access and do not provide views of the ocean and horizon.

Bayside Industrial areas have low sensitivity because they are not susceptible to changes to their character from the NY Bight projects due to having similar industrial characteristics, including tall, vertical elements and blocky infrastructure, and the low scenic quality of industrial areas and oftentimes poor condition contribute to the low value associated with the character of these areas. Bayside Industrial areas occur sporadically, mostly along the mainland coastal edge of both New York and New Jersey. There is a higher density of industrial areas within the mainland edge of Brooklyn and western Long Island.

Bayside Industrial Resource

The Bayside Industrial Resource areas consist of industrial zones such as wastewater treatment plants, landfills, and quarries. These industrial resource areas are generally smaller in scale than other industrial facilities, less dependent on large facilities for manufacturing, and are frequently visually obscured by vegetation. These facilities are often more secluded and obscured behind forested areas. The industrial elements within this category generally have low-lying, horizontal flat features, such as retention ponds and mining pits, that may not be visible from public rights-of-way.

Bayside Industrial Resource areas have low sensitivity because they are not susceptible to changes to their character from the NY Bight projects due to having similar industrial characteristics, including tall, vertical elements and blocky infrastructure. Also, the low scenic quality of industrial resource areas and their oftentimes poor condition contribute to the low value associated with the character of these areas. Industrial resource areas occur sporadically, mostly along the mainland coastal edge of both New York and New Jersey. There is a higher density of Bayside Industrial Resource areas within the mainland edge of Brooklyn and western Long Island.

Bayside Military Site

These sites may have docks, piers, or other waterfront resources. When not obscured by vegetation, such as dense trees, military sites generally consist of light industrial and office buildings, gravel roads, chain-link fence, and railways. Buildings are generally small, square, and nondescript in the traditional industrial style of the early 20th century.

Bayside Military Sites are low in sensitivity. They are not susceptible to changes to their character from the NY Bight projects due to their existing light industrial character, including their blocky infrastructure, and they are moderately valued for having some forested areas that contribute to the areas' scenic qualities and having bayside elements like docks and piers. The only Bayside Military Site is near Leonardo, New Jersey, within Sandy Hook Bay.

Bayside Natural Area Upland

Upland forests, shrubland, and grasses within natural or natural-appearing spaces occur within islands of the non-ocean waterbodies, as well as on adjacent bayside upland areas on the mainland and barrier islands. These upland natural areas maintain visual connection to the bay, estuaries, inlets, etc., and often have trails or other forms of access from the natural areas to the non-ocean waterbodies.

Bayside Natural Area Uplands are highly sensitive due to their natural sense of place, and lack of human development or industrial features, making these areas highly susceptible to change from the NY Bight projects. They are also highly valued due to their high scenic quality, wildness, and tranquility. This character area is common along the coastal edges of the mainland in both New York and New Jersey, typically occurring directly behind, and slightly elevated from, tidal wetlands. They are more common in the mainland of southern New Jersey. They can also occur on sufficiently elevated islands and within the non-ocean waterbodies and the barrier islands themselves, which is more common within Long Island.

Bayside Natural Area Wetland

Large swaths of wetlands, marshes, estuaries, mudflats, and islands exist within the interior inlets or sounds, and on the mainland side of coastal islands. Due to the changing nature of the boundaries of marshes, borders of these areas are less defined compared to more stable habitats such as forests. These areas are dominated by emergent grasses, reeds, and rushes.

Bayside Natural Area Wetlands are highly sensitive due to their natural sense of place, and lack of human development or industrial features, making these areas highly susceptible to change from the NY Bight projects. They are also highly valued due to their high scenic quality, wildness, and tranquility. From Ocean City north to Barnegat Lighthouse, a significant portion of the area between the mainland

and the barrier islands is Bayside Natural Area Wetland. The character area also extends from Jamaica Bay to Fire Island.

Bayside Recreation

Bayside Recreation consists of developed green space along the edge of a bay, which has amenities adjacent to a beach. These recreational areas are differentiated from other greenspaces, such as natural areas, by their scale of human development and recreational focus. These non-natural appearing areas often have seascape-related amenities such as marinas, fishing piers, boat launches, and water parks, as well as parks with significant sports and recreational resources such as tennis courts, baseball diamonds, walking trails in non-natural landscapes, and public and private golf courses.

Bayside Recreation areas are highly sensitive. The infrastructure is often limited in these areas, making their character highly susceptible to change. They are highly valued due to their high scenic qualities and locally held values, and are often historic designated parks.

Bayside Residential

Bayside Residential consists of developed land that contains mostly residential units of low to high density; with views of bayside saltwater waterbodies from any vantage point, including marinas, docks, and piers; or that are located directly on the shoreline itself. These homes often have direct access to the waterfront and are generally designed in a way to provide significant views of the inlets, marshes, rivers, or other areas on the landward side of the barrier islands. The shoreline can be hardened and highly developed with houses built directly on piers or adjacent to hard-edged shorelines, or soft, naturalized, gradual slopes. The scale of development can be variable.

The Bayside Residential character area is highly sensitive. The composition of low to high density structures—some of which may have architectural historic interest—and lack of industrial elements makes for a character that is highly susceptible to change from the NY Bight projects. Bayside Residential areas are highly valued due to their scenic quality, houses’ architectural and/or historic interest, and locally held values based on the bayside orientation.

Bayside Urban

Bayside Urban includes highly developed land with a view of bayside waterbodies from any vantage point—including marinas, docks, and piers—or that are located directly on the bayside shoreline. These areas are multiuse, with a mix of commercial, residential, and public lands. There can be restaurants, commercial districts, or public/private parks with significant infrastructure for waterfront access, such as large marinas or piers.

The sensitivity for Bayside Urban areas is medium. They are typically characterized by dense built structures with significant waterfront access infrastructure. This highly developed area has low susceptibility to character change from the NY Bight projects. Bayside Urban areas are highly valued for their tourism value and connection to the bayside waterbodies, and sometimes for having historically significant features. In Atlantic City, much of the Bayside Urban area consists of large hotels and entertainment complexes situated along the water’s edge. In addition, houses, condominiums, and apartment buildings are densely situated along the canals and marinas.

Bayside Waterbodies

Bayside Waterbodies are partially enclosed marine waterbodies with direct access to the ocean and the associated docks, marinas, and other infrastructure. Although not essential to the viewing experience, these areas may have full, partial, or no views of the ocean and extend to the edge of river deltas and other waterbodies.

Bayside Waterbodies are highly sensitive and highly valued for their scenic qualities. These calm waterbodies are highly susceptible to change. The inlets between Ocean City and Seaside Park, with their extensive natural areas, are an example of Bayside Waterbodies.

Seascape Residential

Seascape Residential areas are neighborhoods directly tied to the seascape character but that do not maintain direct views of the ocean, non-ocean waterbodies, beaches, or other marine infrastructure. They are intrinsically connected to the seaside character due to proximity, character of the built environment, or overall experience, but they do not directly connect to the ocean features. For example, a barrier island may be large enough that the interior residential streets maintain cohesive cultural and/or architectural cues to seaside elements but are too far from beach access points or are disconnected due to distance and large roads that act as a visual and physical barrier to the ocean and non-ocean waterbodies.

These areas are highly sensitive, highly susceptible to change from industrial infrastructure, and highly valued for their aesthetic and perceptual elements. Ocean City, Mantoloking, and Navesink are all examples of Seascape Residential areas.

Seascape Urban

Seascape Urban areas include developed urban land that is directly tied to seascape character but does not maintain direct views of the ocean, dunes, beaches, or other marine infrastructure. They have medium sensitivity and are typically characterized by densely built structures and are highly locally valued for their integration into the seascape character elements and tourism. Atlantic City, New Jersey, and Island Park, New York, are examples of Seascape Urban areas.

Oceanside Seascape Types maintain clear visibility and connectivity to the ocean. The shared inter-visibility between natural lands and developed areas and the sea is such that the land, coastline, and sea maintain visibility of the ocean.

Nearshore Ocean

The nearshore ocean stretches 3 nm (5.5 kilometers) from the coastline in which the ocean relates to the seascape. Here, long horizontal waves typically roll towards the coast, with regular whitecaps and breaking waves occurring, except in calm weather. Colors and textures vary consistently, and change constantly, throughout this stretch of water.

Nearshore Ocean is highly sensitive due to its pristine, flat, vast, and minimal character and lack of infrastructure and industrial elements. It is highly valued for scenic qualities, wildness, and tranquility. Nearshore ocean extends all along the New York and New Jersey.

Oceanside Beach

Oceanside Beach areas maintain features, such as dunes and vegetation, in a way that makes the beach appear to be natural or have a minimal human impact. Here, human development is either not present, mostly obscured, or is built in a way that enhances rustic and/or natural features. Activities are passive and active, from swimming, surfing, and beachcombing, to relaxation and viewing nature. The emphasis of the view is the uninterrupted, wide horizon of the beach and ocean. Examples include Brigantine Beach, Island Beach State Park, and Highland Beach of Sandy Hook National Park in New Jersey. New York examples include Breezy Point and the majority of Fire Island’s coastline.

Oceanside Beach is highly susceptible to changes due to its flat nature and natural appearance, is highly valued due to scenic quality and locally held values, and is therefore a highly sensitive environment.

Oceanside Recreation

Oceanside Recreation areas are characterized by developed recreational park land with a view of the beach and/or ocean from any vantage point. These include walking trails and seaside promenades, seaside recreational resources, public marinas, and piers. The infrastructure is often limited within Oceanside Recreation areas, but when it is present, it is human-scale and not industrial. Jones Beach and Robert Moses State Park are examples of Oceanside Recreation areas.

The Oceanside Recreation character is highly susceptible to change. These areas are highly valued due to their high scenic qualities with oceanside characteristics and their locally held values, and they are often natural or historic designated parks.

Oceanside Residential/Commercial

This zone consists of developed residential land, with a view of the beach and/or ocean from any vantage point. Architectural styles vary, but seaside residential units may reflect cottage, Victorian, and modern styles with an emphasis on decks, balconies, and windows that encourage views of the surrounding seascape. Access to the beach and ocean is often delineated through fenced walkways or boardwalks, often at the end of streets that abut dunes, guiding individuals up the dunes to the beach and ocean. In other instances, commercial areas such as cafes, gift shops, hotels, and other small-scale businesses are intermixed with residential units and maintain architectural vernacular that connects them to the seascape. Vegetation can include dune grasses and shrubs along the more natural beach and dune edge, and conventional landscaping elements within the properties themselves.

These areas are highly sensitive. The medium density structures with historic buildings and architectural significance is moderately susceptible to change. The scenic quality, historic interest, and local value towards oceanside orientation make this character area highly sensitive. Oceanside Residential/Commercial areas occur between Ocean City and Ventnor City.

Oceanside Urban

Oceanside Urban areas consist of dense residential, commercial, and public lands, while still emphasizing the view of the beach and/or ocean. Certain elements that regularly occur, such as boardwalks or other paths along the beach edge, provide additional means for recreation, including food, drink, and other entertainment. Although the oceanside urban structures are often dense they have scenic quality and historic interest. Brighton Beach and Long Beach are examples of Oceanside Urban areas, with a variety of dense multi-use buildings, hotels, and beach recreation.

The scenic quality, historic interest, and local value towards oceanside and historically significant features make these areas highly valued environments.

H.3.1.1.3 Landscape Character

Land uses and landcover types vary significantly across the Landscape Character type. The common thread amongst the landscape character areas is that they have minimal visibility and opportunities for interaction with the ocean and/or seascape in general. Typologies in the study range from the highly urban, dense built environment of Manhattan, suburban New Jersey, and the agricultural landscapes of eastern Long Island, to the extensive natural areas of central New Jersey. While changes in elevation may allow for rare instances of ocean views from certain vantage points, such as skyscrapers in Midtown Manhattan, the landscape and seascape boundary is on the mainland wherever direct, ground-level connectivity to the seascape has ended.

Inland Agriculture

This character area consists of managed fields for agricultural purposes, and the adjacent housing and related agricultural structures such as barns, silos, and other elements of the farmstead. Fields are typically large, rectangular, and consist of pasture, row crops, or large raised beds and/or greenhouse structures for a variety of crops and agricultural products.

Inland Agriculture areas are highly sensitive. Agricultural areas consist of open fields with flat to rolling hills containing farm-related light industrial infrastructure such as silos that lend significant vertical elements to the character, making Inland Agriculture areas moderately susceptible to change due to the NY Bight projects. Agricultural fields provide tranquil scenic quality and open landscape views, making for high locally held values associated with them and overall high value in their character. This character area is found inland and to the far south in New Jersey, and inland to the far east of Long Island.

Inland Commercial Park

Inland Commercial Park areas are composed of office complexes, big box stores, strip malls, and parking lots. Relatively few residential units exist within these landscapes. Buildings are nondescript, often single-story buildings, but may contain office complexes several stories tall. Major roads and highways may have such office parks and strip malls along them, but these character areas are specifically delineated when the density of such development is significant. These typically occur near highway ramps and have no proximity to or view of the ocean.

Inland Commercial Park areas have low sensitivity. Their blocky, nondescript built features and varying human development create low susceptibility to changes in character from the NY Bight projects, and the low scenic quality of commercial parks contributes to the low value associated with their character. Inland Commercial Park occurs frequently adjacent to urban and residential areas along stretches of highway.

Inland Industrial

These are significant areas of developed land that are industrial in nature, with features such as smokestacks, large blocky buildings, and limited access to the shoreline for the public. While they are connected to residential and urban areas, these large areas typically lack public access and do not particularly provide views of the ocean and horizon. Bare earth, concrete, waste pilings, metal silos, warehouses, vehicles, and industrial materials are typical in this environment.

Inland Industrial areas have low sensitivity because they have a low susceptibility to changes to their character from the NY Bight projects due to their similar industrial characteristics, including tall, vertical elements and blocky infrastructure; the low scenic quality of industrial areas and their oftentimes poor condition contribute to the low value associated with the character of these areas. Inland Industrial areas are sporadic throughout the geographic analysis area, with increasing frequency in areas surrounding New York City and Jersey City.

Inland Industrial Resource

Inland Industrial Resource areas consist of industrial zones related to natural resources, such as wastewater treatment plants, landfills, and quarries. They are generally smaller in scale than other industrial facilities, less dependent on large facilities for manufacturing, and are frequently visually obscured by vegetation. These facilities are often more secluded and obscured behind forested areas. The industrial elements within this category are smaller in scale and generally consist of low-lying, horizontal flat features, such as retention ponds and mining pits, that may not be visible from public rights-of-way.

Inland Industrial Resource areas have low sensitivity. They are moderately susceptible to changes to their character from the NY Bight projects. Although there is an industrial character, infrastructure is at a smaller scale with often low-lying horizontal flat features. However, the low scenic quality of Inland Industrial Resource areas contributes to the low value associated with their character. Inland Industrial Resource areas are infrequent but dispersed evenly throughout the geographic analysis area. They often exist along the edge of large population centers, adjacent to forests and/or wetlands.

Inland Military Site

When not obscured by vegetation such as dense trees, Inland Military Sites generally consist of light industrial infrastructure, office buildings, gravel roads, chain-link fence, and railways making them moderately valued. Buildings are generally small, square, and nondescript in the traditional industrial style of the early 20th century.

Inland Military Sites consist of extensive forested areas of moderate to high scenic quality, along with varying industrial elements, making them moderately susceptible to changes to their character from the NY Bight projects and moderately valued due to their scenic qualities. Sections of central and southern New Jersey have large military complexes, mostly set far from developed areas.

Inland Natural Area

Inland Natural Areas predominantly include greenspace that is natural or natural appearing. Inland, this typically comprises forests, savannahs, and grasslands. Pine barrens are a representative habitat of such natural area. These spaces lack significant development, or at least appear to lack development, using smaller trails and paths enclosed in these natural spaces, rather than wide trails with high visibility.

Inland Natural areas are highly sensitive due to their sense of place and lack of human development/ built environment, making these areas highly susceptible to change from the NY Bight projects. They are also highly valued due to their high scenic quality, wildness, and tranquility. Much of inland central and southern New Jersey is composed of natural areas. In contrast, far eastern Long Island has significant natural areas; western and central Long Island has natural areas along inland waterbodies.

Inland Recreation

These areas include developed recreational park lands with no view of the beach and/or ocean and that are clearly part of the inland landscape. These include parks with significant sports and recreational resources such as tennis courts, baseball diamonds, walking trails in non-natural landscapes, as well as public and private golf courses.

Inland Recreation areas are highly sensitive. They are mainly composed of developed parks and sports infrastructure, which is not similar in character to WTG infrastructure, making the character of the area highly susceptible to change. Recreation areas have high locally held value, often have significant or historic designation, and have high scenic qualities, making them highly valued in character. In Long Island, many of these areas are highly developed parks with baseball fields, tracks, open fields for recreation, and clearly designed walking paths, all identifying areas for specific active recreation.

Inland Rural

Inland Rural areas have a low population density. Architecturally there may be similar vernacular elements related to agricultural areas, but significant architectural and structural elements persist between Inland Rural and the Inland Suburban/Exurban Residential character areas.

Sensitivity is high for Inland Rural character areas. These areas are typically open with flat to rolling hills with sparse residential structures, making the character of the area highly susceptible to change due to the NY Bight projects. They may have valued conservation and open space areas around the sparse residential homes, but the homes themselves typically lack architectural interest, making them moderately valued. Southern inland New Jersey and far eastern Long Island have instances of low-density housing often set within natural areas such as forest land, or adjacent to agricultural fields. These do not include farmsteads, but rather the low-density development far from the urban/suburban core.

Inland Suburban/Exurban Residential

Inland Suburban/Exurban Residential character areas reflect developed land, mostly residential units, that do not have a view of the beach and/or ocean from any vantage point. These neighborhoods are clearly part of the inland landscape, and lack connection or reference to the seascape. They vary in architectural styles and densities, but most importantly do not bear architectural or cultural elements associated with seaside communities. There is significant variation in architectural and structural styles of Inland Suburban/Exurban Residential areas, ranging from conventional suburban design at various densities, to exurban and rural styles.

The Inland Suburban/Exurban Residential character areas are highly sensitive. They lack industrial elements similar to that of a WTG and are composed of mostly residential structures, which are minimal when compared to the project infrastructure, making the area highly susceptible to change to its character due to the NY Bight projects. These areas may have valued conservation and open space areas around the residential neighborhoods, but the homes themselves lack significant architectural elements and there are no particular locally held values tied to this character, making it moderately valued. In Long Island, the Inland Suburban/Exurban Residential area is defined by a dense, gridded network of streets and homes, of varying styles typical of suburban conventions of the 20th century. In New Jersey, there is a similar density closer to the coast. Further inland, the housing density and size of homes increases, and the structure of neighborhoods is less gridded.

Inland Urban

Inland Urban areas consist of developed land without a view of the beach or ocean from any vantage point. Dense commercial areas, dense residential areas with apartment buildings, and other areas with significant development are considered in this landscape.

Inland Urban character areas are overall low in sensitivity. They typically have lower scenic qualities, but have locally held value, tourism value, and sometimes historically significant features, making their character moderately valued. Long Island, New York, includes several examples of Inland Urban.

H.3.1.2 Sensitivity

The sensitivity of an open ocean, seascape, or landscape impact receptor is dependent on its susceptibility to change and its perceived value to society. Sensitivity is based on the value placed on a character area by residents and visitors and the susceptibility of the character area, which is the ability to accept or not accept additions of elements or features that affect the scenic character of that area. Receptor sensitivity is recorded on an ordinal scale of high, medium, or low based on information from the baseline data collected; therefore, sensitivity of each character area is determined and described in the character area classification part of the methodology. Section 3.6.9, Table 3.6.9-5, Table 3.6.9-6, and Table 3.6.9-7 contain detailed definitions of the criteria ratings (high, medium, low) for susceptibility, value, and sensitivity. *Ocean, Seascape, Landscape, and Visual Impact Assessment of the New York Bight Offshore Wind Lease Areas* (Argonne 2024) has detailed baseline data and descriptive rationale for the rating determinations.

Table H-12 summarizes the susceptibility, value, and sensitivity ratings for the open ocean, seascape, and landscape character as described in the preceding character area descriptions.

Table H-12. Open ocean, seascape, and landscape sensitivity

Open Ocean, Seascape, and Landscape Character Area	Susceptibility	Value	Sensitivity
Open Ocean	High	High	**High**
Seascape – Bayside Seascape			
Bayside Commercial Park	Low	Low	**Low**
Bayside Industrial	Low	Low	**Low**
Bayside Industrial Resource	Low	Low	**Low**
Bayside Military Site	Low	Medium	**Low**
Bayside Natural Area Upland	High	High	**High**
Bayside Natural Area Wetland	High	High	**High**
Bayside Recreation	High	High	**High**
Bayside Residential	High	High	**High**
Bayside Urban	Low	High	**Medium**
Bayside Waterbodies	High	High	**High**
Seascape Residential	High	High	**High**
Seascape Urban	Low	High	**Medium**
Seascape – Oceanside Seascape			
Nearshore Ocean	High	High	**High**
Oceanside Beach	High	High	**High**
Oceanside Recreation	High	High	**High**
Oceanside Residential/Commercial	Medium	High	**High**
Oceanside Urban	Medium	High	**High**
Landscape			
Inland Agriculture	Medium	High	**High**
Inland Commercial Park	Low	Low	**Low**
Inland Industrial	Low	Low	**Low**
Inland Industrial Resource	Medium	Low	**Low**
Inland Military Site	Medium	Medium	**Medium**
Inland Natural Area	High	High	**High**
Inland Recreation	High	High	**High**
Inland Rural	High	Medium	**High**
Inland Suburban/Exurban Residential	High	Medium	**High**
Inland Urban	Low	Medium	**Low**

H.3.1.3 Magnitude

The magnitude of effect in an open ocean, seascape, or landscape depends on the size or scale of the change associated with the proposed project, the geographic extent of the change based on the viewshed, and the duration and reversibility of a NY Bight project. Acreages of character areas in the offshore geographic analysis area overall and within the viewshed (i.e., the amount of character area from which the WTG array would be visible) are listed in Table H-13 for the 1,312-foot (400-meter) wind turbines and Table H-14 for the 853-foot (260-meter) wind turbines. Each lease area is measured/calculated as a fraction of the entire six lease area. The acreages for each individual lease are greater than the total area for the geographic analysis area because the lease viewsheds overlap.

Note that character areas that not a part of the geographic extent that is visually exposed to the offshore projects but that are adjacent to it may not be physically affected but may be perceptually affected. For instance, the Oceanside Residential character areas on Long Beach Island that have views to the offshore project may be the only character areas on the island that are directly affected. However, the other character areas of Long Beach Island adjacent to or one removed from the Oceanside Residential character areas (e.g., Seascape Residential, Bayside Recreation, Bayside Commercial Park, Bayside Urban) may be perceptually affected because they are all a cohesive part of the Long Beach Island community, and the offshore wind energy development becomes a part of the identity of the whole community.

Size and scale of change considers changes to the physical elements of the open ocean, seascape, and landscape, and their aesthetic, experiential, and perceptual aspects. Although size and scale does not refer to the size and scale of the project per se, understanding the degree of visibility provides measurable context for analyzing the perceptual aspects of scale, prominence, and impacts on open ocean, seascape, and landscape. Table H-15 and Table H-16 list specific locations in New York and New Jersey where the NY Bight projects' noticeable features, based on their heights, distances, and EC for the 1,312-foot (400-meter) WTGs and 853-foot (260-meter) WTGs, respectively, have a perceptual effect on the open ocean, seascape, or landscape. Higher impact levels would stem from unique, extensive, and long-term appearance of strongly contrasting, large, and prominent vertical structures in the otherwise horizontal open ocean and seascape environments where wind turbine structures are an unexpected element. Table H-17 and Table H-18 break out the geographic extent of each character area based on project noticeability and provide additional detail to describe the degree of change from existing conditions for each lease area. Within Table H-17 and Table H-18, the project analysis area corresponds to the area within a 50-mile (80.5-kilometer) buffer of each individual lease area and is equivalent to the geographic analysis area for all six NY Bight lease areas. The impact area is the portion of the project analysis area that is visible and is associated with each individual lease area, not all six lease areas combined.

Operational effects would be similar to those of end-stage construction and installation and would be long term and fully reversible. The duration and reversibility of each character area is documented in the summary tables, Table H-19 through Table H-32.

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Table H-13. Area of open ocean, seascape, and landscape character areas within the project area viewsheds for 1,312-foot WTGs

Character Area	Total Area in the Geographic Analysis Area		Area Within the 1,312-Foot WTG GAA Viewshed [1]													
			New York Bight All Lease Areas		OCS-A 0537		OCS-A 0538		OCS-A 0539		OCS-A 0541		OCS-A 0542		OCS-A 0544	
	Square Miles	Square Kilometers	Square Miles (km²)	Percent Affected	Square Miles (km²)	Percent Affected	Square Miles (km²)	Percent Affected	Square Miles (km²)	Percent Affected	Square Miles (km²)	Percent Affected	Square Miles (km²)	Percent Affected	Square Miles (km²)	Percent Affected
Open Ocean	15,569.90	40,325.86	15,569.90 (40,325.86)	100.00%	8,948.43 (23,176.33)	57.47%	8,987.57 (23,277.71)	57.7%	9,268.76 (24,005.98)	59.5%	8,568.93 (22,193.44)	55.0%	9,011.49 (23,339.64)	57.9%	6,844.82 (17,728.00)	44.0%
Bayside Seascape																
Bayside Commercial Park	0.44	1.15	0.001 (0.004)	0.3%	--	--	0.000 (0.001)	0.1%	0.000 (0.001)	0.1%	0.000 (0.001)	0.1%	0.000 (0.000)	0.02%	0.000 (0.001)	0.1%
Bayside Industrial	5.74	14.87	0.047 (0.121)	0.8%	0.000 (0.000)	0.0%	--	--	--	--	0.000 (0.001)	0.8%	0.000 (0.000)	0.02%	0.046 (0.120)	0.8%
Bayside Industrial Resource	0.42	1.09	0.115 (0.299)	27.3%	--	--	--	--	--	--	0.000 (0.003)	0.9%	0.001 (0.002)	0.5%	0.114 (0.295)	27%
Bayside Military Site	0.58	1.49	0.040 (0.103)	6.9%	--	--	0.037 (0.095)	6.4%	0.033 (0.085)	5.7%	0.027 (0.070)	4.7%	--	--	0.031 (0.081)	5.5%
Bayside Natural Upland	13.81	35.76	0.441 (1.141)	3.2%	0.009 (0.024)	0.1%	0.003 (0.008)	0.1%	0.004 (0.010)	0.1%	0.006 (0.015)	0.2%	0.003 (0.008)	0.1%	0.424 (1.099)	3.1%
Bayside Natural Wetland	154.00	398.85	65.994 (170.923)	42.9%	0.297 (0.769)	0.2%	0.071 (0.184)	0.1%	7.439 (19.267)	6.6%	51.343 (132.979)	45.4%	18.109 (46.903)	16.0%	14.158 (36.669)	9.2%
Bayside Recreation	13.98	36.22	0.924 (2.394)	6.6%	0.015 (0.038)	0.1%	0.017 (0.045)	0.5%	0.018 (0.048)	0.5%	0.038 (0.099)	1.0%	0.013 (0.033)	0.3%	0.863 (2.236)	6.2%
Bayside Residential	71.73	185.78	1.848 (4.788)	2.6%	0.102 (0.265)	0.1%	0.119 (0.308)	0.3%	0.286 (0.742)	0.8%	0.564 (1.460)	1.5%	0.185 (0.479)	0.5%	1.113 (2.883)	1.6%
Bayside Urban	12.06	31.22	0.122 (0.316)	1.0%	0.003 (0.009)	0.03%	0.004 (0.011)	0.1%	0.002 (0.005)	0.1%	0.064 (0.164)	1.5%	0.048 (0.124)	1.2%	0.053 (0.136)	0.4%
Bayside Waterbodies	419.31	1,086.01	184.216 (477.116)	43.9%	0.994 (2.574)	0.2%	0.610 (1.579)	0.3%	16.438 (42.574)	8.3%	58.779 (152.236)	29.8%	13.398 (34.701)	6.8%	124.47 (322.38)	29.7%
Seascape Residential	9.04	23.42	0.046 (0.119)	0.5%	--	--	0.019 (0.049)	0.4%	0.011 (0.027)	0.2%	0.016 (0.041)	0.3%	0.010 (0.025)	0.2%	0.013 (0.034)	0.1%
Seascape Urban	1.39	3.61	0.001 (0.002)	0.1%	--	--	0.001 (0.002)	3.3%	0.001 (0.002)	3.%	0.001 (0.002)	4.7%	0.001 (0.002)	4.1%	--	--
Oceanside Seascape																
Nearshore Ocean	636.12	1,647.54	635.906 (1646.990)	99.9%	114.791 (297.306)	18.1%	167.83 (434.67)	26.4%	199.94 (517.84)	31.43%	235.88 (610.91)	37.1%	183.79 (476.01)	28.9%6,8	433.90 (1,123.79)	68.2%
Oceanside Beach	12.87	33.32	7.807 (20.219)	60.7%	2.354 (6.098)	18.3%	1.073 (2.780)	22.2%	2.076 (5.378)	42.9%	2.279 (5.902)	47.0%	2.094 (5.424)	43.2%	5.366 (13.899)	41.7%
Oceanside Recreation	6.97	18.05	3.265 (8.457)	46.9%	0.623 (1.614)	9.0%	0.000 (0.001)	0.1%	0.000 (0.001)	0.1%	0.000 (0.000)	0.1%	0.000 (0.000)	0.1%	3.229 (8.364)	46.3%
Oceanside Residential/Commercial	20.12	52.10	6.193 (16.041)	30.8%	0.698 (1.808)	3.5%	2.982 (7.723)	22.2%	2.763 (7.156)	20.6%	3.093 (8.010)	23.0%	2.309 (5.980)	17.2%	3.616 (9.367)	18.0%
Oceanside Urban	4.94	12.80	1.482 (3.839)	30.0%	--	--	0.243 (0.630)	10.2%	0.128 (0.332)	5.3%	0.384 (0.995)	16.0%	0.350 (0.907)	14.6%	1.109 (2.871)	22.4%
Landscape																
Inland Agriculture	21.27	55.09	0.014 (0.037)	0.1%	--	--	0.001 (0.001)	0.03%	0.004 (0.010)	0.2%	0.012 (0.030)	0.6%	--	--	0.002 (0.004)	0.0%
Inland Commercial Park	38.16	98.84	0.042 (0.108)	0.1%	0.000 (0.000)	0.00%	0.007 (0.018)	0.1%	0.009 (0.023)	0.1%	0.024 (0.063)	0.2%	0.007 (0.019)	0.1%	0.011 (0.028)	0.00%

	Total Area in the Geographic Analysis Area		Area Within the 1,312-Foot WTG GAA Viewshed [1]														
			New York Bight All Lease Areas		OCS-A 0537		OCS-A 0538		OCS-A 0539		OCS-A 0541		OCS-A 0542		OCS-A 0544	
Character Area	Square Miles	Square Kilometers	Square Miles (km²)	Percent Affected	Square Miles (km²)	Percent Affected	Square Miles (km²)	Percent Affected	Square Miles (km²)	Percent Affected	Square Miles (km²)	Percent Affected	Square Miles (km²)	Percent Affected	Square Miles (km²)	Percent Affected
Inland Industrial	30.08	77.92	0.243 (0.629)	0.8%	0.000 (0.000)	0.00%	0.000 (0.001)	0.00%	0.001 (0.002)	0.01%	0.001 (0.004)	0.02%	0.001 (0.001)	0.01%	0.241 (0.625)	0.08%
Inland Industrial Resource	18.55	48.04	0.276 (0.715)	1.5%	--	--	0.003 (0.007)	0.02%	0.007 (0.019)	0.1%	0.073 (0.189)	0.5%	0.001 (0.004)	0.01%	0.201 (0.522)	1.1%
Inland Military Site	20.39	52.82	0.244 (0.632)	1.2%	--	--	--	--	--	--	0.244 (0.632)	1.2%	--	--	--	--
Inland Natural Area	455.94	1180.89	0.469 (1.216)	0.1%	0.001 (0.003)	0.00%	0.013 (0.032)	0.00%	0.045 (0.116)	0.01%	0.429 (1.112)	0.1%	0.062 (0.162)	0.02%	0.029 (0.075)	0.00%
Inland Recreation	29.30	75.88	0.082 (0.212)	0.3%	--	--	0.004 (0.010)	0.1%	0.001 (0.004)	0.02%	0.059 (0.152)	0.8%	0.019 (0.049)	0.3%	0.020 (0.052)	0.01%
Inland Rural	25.60	66.30	0.114 (0.295)	0.4%	--	--	0.001 (0.003)	0.00%	0.002 (0.005)	0.01%	0.007 (0.018)	0.03%	0.000 (0.001)	0.00%	0.106 (0.273)	0.4%
Inland Suburban/Exurban Residential	691.95	1792.14	0.596 (1.543)	0.1%	0.110 (0.285)	0.02%	0.152 (0.394)	0.1%	0.159 (0.411)	0.1%	0.247 (0.640)	0.1%	0.088 (0.229)	0.04%	0.115 (0.298)	0.00%
Inland Urban	157.39	407.65	0.203 (0.525)	0.1%	--	--	0.007 (0.018)	0.1%	0.005 (0.014)	0.1%	0.006 (0.016)	0.1%	--	--	0.190 (0.492)	0.01%

Note: areas <0.00 square mile (0.00 square kilometer) = 0.64 acre or less.
Source: Argonne 2024
[1] Areas are not additive across leases due to overlap in lease area viewsheds. The area affected is a percentage of the total area GAA, not the individual lease area.
km² = square kilometers

Table H-14. Area of open ocean, seascape, and landscape character areas within the project area viewsheds for 853-foot WTGs

Character Area	Total Area in the Geographic Analysis Area		Area Within the 853-Foot WTG GAA Viewshed [1]														
			New York Bight All Lease Areas		OCS-A 0537		OCS-A 0538		OCS-A 0539		OCS-A 0541		OCS-A 0542		OCS-A 0544		
	Square Miles	Square Kilometers	Square Miles (km^2)	Percent Affected	Square Miles (km^2)	Percent Affected	Square Miles (km^2)	Percent Affected	Square Miles (km^2)	Percent Affected	Square Miles (km^2)	Percent Affected	Square Miles (km^2)	Percent Affected	Square Miles (km^2)	Percent Affected	
Open Ocean	15,569.90	40,325.86	12,962.88 (33,573.71)	83.26%	8,948.43 (23,176.34)	57.5%	6,555.41 (16,978.44)	42.1%	6,868.38 (17,789.03)	44.11%	6,331.05 (16,397.35)	40.66%	6,625.01 (17,158.69)	42.55%	5,226.68 (13,537.03)	33.57%	
Seascape																	
Bayside Commercial Park	0.44	1.15	0.001 (0.002)	0.15%	--	--	<0.000 (0.001)	0.01%	<0.000 (0.000)	0.03%	<0.000 (0.000)	0.01%	<0.000 (0.000)	0.01%	<0.000 (0.001)	0.06%	
Bayside Industrial	5.74	14.87	0.043 (0.011)	0.74%	--	--	--	--	--	--	<0.000 (0.000)	0.00%	--	--	0.043 (0.110)	0.74%	
Bayside Industrial Resource	0.42	1.09	0.106 (0.275)	25.12%	--	--	--	--	--	--	0.001 (0.001)	0.13%	0.000 (0.001)	0.06%	0.106 (0.273)	24.99%	
Bayside Military Site	0.58	1.49	0.004 (0.011)	0.74%	--	--	0.003 (0.008)	0.52%	<0.000 (0.001)	0.05%	<0.000 (0.000)	0.03%	--	--	--	0.38%	
Bayside Natural Upland	13.81	35.76	0.187 (0.485)	1.36%	0.001 (0.002)	0.01%	<0.000 (0.001)	0.00%	0.001 (0.003)	0.01%	0.003 (0.007)	0.02%	0.001 (0.002)	0.01%	0.183 (0.474)	1.33%	
Bayside Natural Wetland	154.00	398.85	12.953 (33.547)	8.41%	0.005 (0.014)	0.00%	0.007 (0.018)	0.00%	0.029 (0.076)	0.02%	7.264 (18.814)	4.72%	0.268 (0.694)	0.17%	5.670 (14.685)	3.68%	
Bayside Recreation	13.98	36.22	0.659 (1.708)	4.72%	0.001 (0.002)	0.01%	0.011 (0.027)	0.08%	0.006 (0.014)	0.04%	0.009 (0.023)	0.06%	0.003 (0.007)	0.02%	0.642 (1.664)	4.59%	
Bayside Residential	71.73	185.78	0.995 (2.576)	1.39%	0.007 (0.019)	0.01%	0.020 (0.051)	0.03%	0.041 (0.106)	0.06%	0.134 (0.347)	0.19%	0.019 (0.049)	0.03%	0.836 (2.166)	1.17%	
Bayside Urban	12.06	31.22	0.059 (0.153)	0.49%	<0.000 (0.000)	0.00%	0.002 (0.005)	0.02%	0.001 (0.002)	0.01%	0.028 (0.073)	0.24%	0.009 (0.024)	0.08%	0.029 (0.076)	0.24%	
Bayside Waterbodies	419.31	1,086.01	87.471 (226.548)	20.86%	0.003 (0.008)	0.00%	0.009 (0.025)	0.00%	0.817 (2.115)	0.19%	5.698 (14.757)	1.36%	0.013 (0.035)	0.00%	81.360 (210.723)	19.40%	
Seascape Residential	9.04	23.42	0.025 (0.066)	0.28%	--	--	--	--	0.004 (0.011)	0.05%	0.010 (0.026)	0.11%	0.005 (0.013)	0.05%	0.004 (0.011)	0.05%	
Seascape Urban	1.39	3.61	0.001 (0.002)	0.05%	--	--	--	--	0.001 (0.002)	0.04%	0.001 (0.002)	0.05%	0.001 (0.002)	0.05%	--	--	
Oceanside Seascape																	
Nearshore Ocean	636.12	1,647.54	388.342 (1005.801)	61.05%	<0.000 (0.001)	0.00%	1.418 (3.672)	0.22%	85.274 (220.860)	13.41%	158.569 (410.691)	24.93%	20.966 (54.302)	3.30%	229.776 (595.118)	36.12%	
Oceanside Beach	12.87	33.32	6.061 (15.699)	47.11%	0.062 (0.160)	0.48%	--	--	1.219 (3.157)	9.47%	2.079 (5.385)	16.16%	0.856 (2.216)	6.65%	3.910 (10.128)	30.40%	
Oceanside Recreation	6.97	18.05	2.656 (6.897)	38.12%	0.002 (0.006)	0.04%	--	--	<0.000 (0.001)	<0.00%	0.000 (0.000)	0.00%	0.000 (0.000)	0.00%	2.655 (6.876)	38.10%	
Oceanside Residential/Commercial	20.12	52.10	3.895 (10.088)	19.36%	0.051 (0.133)	0.26%	--	--	1.914 (4.958)	9.52%	2.186 (5.661)	10.86%	1.509 (3.907)	7.50%	1.555 (4.027)	7.73%	
Oceanside Urban	4.94	12.80	0.979 (2.535)	19.81%	--	--	--	--	0.086 (0.222)	1.74%	0.209 (0.542)	4.24%	0.044 (0.115)	0.90%	0.761 (1.971)	15.40%	
Landscape																	
Inland Agriculture	21.27	55.09	0.002 (0.004)	0.01%	--	--	<0.000 (0.001)	0.00%	0.001 (0.003)	0.00%	0.000 (0.000)	0.00%	--	--	0.000 (0.000)	0.00%	

Character Area	Total Area in the Geographic Analysis Area		Area Within the 853-Foot WTG GAA Viewshed [1]															
			New York Bight All Lease Areas		OCS-A 0537		OCS-A 0538		OCS-A 0539		OCS-A 0541		OCS-A 0542		OCS-A 0544	
	Square Miles	Square Kilometers	Square Miles (km^2)	Percent Affected	Square Miles (km^2)	Percent Affected	Square Miles (km^2)	Percent Affected	Square Miles (km^2)	Percent Affected	Square Miles (km^2)	Percent Affected	Square Miles (km^2)	Percent Affected	Square Miles (km^2)	Percent Affected
Inland Commercial Park	38.16	98.84	0.020 (0.053)	0.05%	<0.00 (0.00)	0.0%	0.01 (0.01)	0.0%	0.005 (0.012)	0.01%	0.014 (0.036)	0.04%	0.004 (0.010)	0.01%	0.002 (0.004)	0.00%
Inland Industrial	30.08	77.92	0.048 (0.125)	0.16%	<0.00 (0.00)	0.0%	<0.00 (0.00)	0.0%	<0.000 (0.001)	0.00%	0.001 (0.002)	0.00%	<0.000 (0.001)	0.00%	0.047 (0.123)	0.16%
Inland Industrial Resource	18.55	48.04	0.213 (0.553)	1.15%	--	--	0.002 (0.005)	0.0%	0.003 (0.009)	0.02%	0.049 (0.127)	0.26%	0.000 (0.001)	0.00%	0.163 (0.423)	0.88%
Inland Military Site	20.39	52.82	0.003 (0.008)	0.02%	--	--	--	--	--	--	0.003 (0.008)	0.02%	--	--	--	--
Inland Natural Area	455.94	1,180.89	0.089 (0.231)	0.02%	<0.00 (0.00)	0.0%	0.006 (0.015)	0.0%	0.015 (0.038)	0.00%	0.066 (0.172)	0.01%	0.004 (0.010)	0.00%	0.019 (0.050)	0.00%
Inland Recreation	29.30	75.88	0.022 (0.058)	0.08%	--	--	0.002 (0.005)	0.01%	<0.000 (0.001)	0.00%	0.007 (0.019)	0.02%	0.001 (0.004)	0.00%	0.013 (0.034)	0.05%
Inland Rural	25.60	66.30	0.035 (0.091)	0.14%	--	--	0.001 (0.002)	0.00%	<0.000 (0.001)	0.00%	0.002 (0.004)	0.01%	<0.000 (0.000)	0.00%	0.033 (0.086)	0.13%
Inland Suburban/Exurban Residential	691.95	1,792.14	0.309 (0.799)	0.04%	0.04 (0.11)	0.0%	0.083 (0.214)	0.01%	0.078 (0.201)	0.01%	0.115 (0.279)	0.02%	0.031 (0.079)	0.00%	0.082 (0.211)	0.01%
Inland Urban	157.39	407.65	0.138 (0.358)	0.09%	--	--	0.004 (0.010)	0.00%	0.001 (0.004)	0.00%	0.002 (0.006)	0.00%	--	--	0.132 (0.343)	0.08%

Note: areas <0.00 square miles (0.00 square kilometers) = 0.64 acres or less.
Source: Argonne 2024.
[1] Areas are not additive across leases due to overlap in lease area viewsheds. The area affected is a percentage of the total area GAA, not the individual lease area.
km^2 = square kilometers

Table H-15. Noticeable elements and impacts by open ocean, seascape, and landscape character area for the 1,312-foot WTGs

Noticeable Elements Impacts	Open Ocean, Seascape, and Landscape Character Areas
R, AL, N, H, O, M, Y Prominence 6	**Open Ocean Character Area**: Ocean
R, AL, N, H, O, M Prominence 5	**Open Ocean Character Area:** Ocean **Seascape Character Areas:** Bayside Natural Wetland, Bayside Residential, Bayside Waterbodies, Nearshore Ocean, Oceanside Beach, Oceanside Recreation, Oceanside Residential (NY: Ocean Beach, Fire Island, Saltaire)
R, AL, N, H Prominence 3–4	**Open Ocean Character Area:** Ocean **Seascape Character Areas:** Bayside Commercial Park, Bayside Industrial, Bayside Industrial Resource, Bayside Natural Upland, Bayside Natural Wetland, Bayside Recreation, Bayside Residential, Bayside Urban, Bayside Waterbodies, Seascape Residential, Seascape Urban, Nearshore Ocean, Oceanside Beach, Oceanside Recreation, Oceanside Residential/Commercial, Oceanside Urban (NY: Brookhaven, Islip, Massapequa Park, Long Beach, Jones Beach. NJ: Beach Haven, Long Beach, Barnegat) **Landscape Character Areas:** Inland Commercial Park, Inland Industrial, Inland Industrial Resource, Inland Natural Area, Inland Recreation, Inland Suburban/Exurban Residential, Inland Urban (NY: Islandia, Islip, Brookhaven, Babylon. NJ: Barnegat Township)
R Prominence 1–2	**Open Ocean Character Area:** Ocean **Seascape Character Areas:** Bayside Commercial Park, Bayside Industrial, Bayside Industrial Resource, Bayside Natural Upland, Bayside Natural Wetland, Bayside Recreation, Bayside Residential, Bayside Urban, Bayside Waterbodies, Seascape Residential, Seascape Urban, Nearshore Ocean, Oceanside Beach, Oceanside Recreation, Oceanside Residential/Commercial, Oceanside Urban (NY: Lawrence, Westhampton Beach, Atlantic Beach, Rockaway Beach, Quogue. NJ: Brigantine, Atlantic City, Monmouth Beach, Highlands, Belmar, Bay Head, Mantoloking, Point Pleasant Beach Borough) **Landscape Character Areas:** Inland Agriculture, Inland Commercial Park, Inland Industrial, Inland Industrial Resource, Inland Military Site, Inland Natural Area, Inland Recreation, Inland Rural, Inland Suburban/Exurban Residential, Inland Urban (NY: Huntington, Southampton. NJ: Barnegat Township, Egg Harbor Township, Berkeley Township, Brick Township, Point Pleasant Beach Borough)

R = rotor, AL = aviation light, N = nacelle, H = hub, M = mid-tower light, O = OSS, Y = yellow tower base color.
Prominence: 0 = Not visible. 1 = Visible only after extended study; otherwise not visible. 2 = Visible when viewing in general direction of the wind farm; otherwise likely to be missed by casual observer. 3 = Visible after brief glance in general direction of the wind farm; unlikely to be missed by casual observer. 4 = Plainly visible; could not be missed by casual observer, but does not strongly attract visual attention or dominate view. 5 = Strongly attracts viewers' attention to the wind farm; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 = Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV

Table H-16. Noticeable elements and impacts by open ocean, seascape, and landscape character area for the 853-foot WTGs

Noticeable Elements Impacts	Open Ocean, Seascape, and Landscape Character Areas
R, AL, N, H, O, M, Y Prominence 6	**Open Ocean Character Area:** Ocean
R, AL, N, H, O Prominence 5	**Open Ocean Character Area:** Ocean **Seascape Character Areas:** Bayside Natural Wetland, Bayside Residential, Bayside Waterbodies, Nearshore Ocean, Oceanside Beach, Oceanside Recreation, Oceanside Residential/Commercial (NY: Fire Island, Saltaire, Davis Park.)
R, AL, N, H Prominence 3–4	**Open Ocean Character Area:** Ocean **Seascape Character Areas:** Bayside Natural Wetland, Bayside Residential, Bayside Waterbodies, Nearshore Ocean, Oceanside Beach, Oceanside Recreation, Oceanside Residential/Commercial (NY: Fire Island, Saltaire, Davis Park.)
R Prominence 1–2	**Open Ocean Character Area**: Ocean **Seascape Character Areas:** Bayside Commercial Park, Bayside Industrial, Bayside Industrial Resource, Bayside Natural Wetland, Bayside Natural Upland, Bayside Recreation, Bayside Residential, Bayside Urban, Bayside Waterbodies, Seascape Residential, Seascape Urban, Nearshore Ocean, Oceanside Beach, Oceanside Recreation, Oceanside Residential/Commercial, Oceanside Urban (NY: Long Beach, Jones Beach, Islip, Mastic Beach, Babylon, Brookhaven. NJ: Beach Haven, Long Beach Island, Surf City) **Landscape Character Areas:** Inland Agriculture, Inland Commercial Park, Inland Industrial, Inland, Industrial Resource, Inland Natural Area, Inland Recreation, Inland Rural Inland Suburban/Exurban Residential, Inland Urban (NY: Massapequa, Patchogue, Islip, Babylon, Brookhaven. NJ: Barnegat Township Tuckerton Borough)

R = rotor, AL = aviation light, N = nacelle, H = hub, O = OSS, M = mid-tower light, Y = yellow tower base color.
Prominence: 0 = Not visible. 1 = Visible only after extended study; otherwise not visible. 2 = Visible when viewing in general direction of the wind farm; otherwise likely to be missed by casual observer. 3 = Visible after brief glance in general direction of the wind farm; unlikely to be missed by casual observer. 4 = Plainly visible; could not be missed by casual observer, but does not strongly attract visual attention or dominate view. 5 = Strongly attracts viewers' attention to the wind farm; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 = Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV

Table H-17. 1,312-foot WTGs scale of change and prominence for open ocean, seascape, and landscape[1]

Scale of Change and Prominence Effects	Open Ocean, Seascape, and Landscape	One Project												Six Projects	
		OCS-A 0537		OCS-A 0538		OCS-A 0539		OCS-A 0541		OCS-A 0542		OCS-A 0544		New York Bight	
		Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Geographic Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)
Large Scale of Change and Prominence of 5 or 6	**Open Ocean Character Area:**														
	Open Ocean	9,416.28 (24,388.1)	3,299.03 (8,544.4)	9,681.22 (25,074.3)	3,406.70 (8,823.3)	9,957.53 (25,789.9)	3,704.96 (9,595.8)	9,062.22 (23,471.1)	3,490.03 (9,039.1)	9,447.28 (24,468.4)	3,464.63 (8,973.4)	7,289.92 (18,880.8)	2,932.73 (7,595.7)	15,569.90 (40,325.9)	8,828.66 (22,866.1)
	Seascape Character Areas:														
	Bayside Natural Wetland											46.78 (121.2)	0.59 (1.5)	154.00 (398.8)	0.59 (1.5)
	Bayside Residential											48.63 (126.0)	0.03 (0.1)	71.73 (185.8)	0.04 (0.1)
	Bayside Waterbodies											257.62 (667.2)	14.80 (38.3)	419.31 (1,086.0)	14.80 (38.3)
	Nearshore Ocean											450.73 (1,167.4)	86.72 (224.6)	636.12 (1,647.5)	86.72 (224.6)
	Oceanside Beach											8.86 (22.9)	0.87 (2.2)	12.87 (33.3)	0.91 (2.4)
	Oceanside Recreation											6.95 (18.0)	0.46 (1.2)	6.97 (18.0)	0.48 (1.2)
	Oceanside Residential/Commercial											13.13 (34.0)	0.67 (1.7)	20.12 (52.1)	0.72 (1.9)
Medium Scale of Change and Prominence of 3 or 4	**Open Ocean Character Area:**														
	Open Ocean	9,416.28 (24,388.1)	2,382.34 (6,170.2)	9,681.22 (25,074.3)	2,422.73 (6,274.8)	9,957.53 (25,789.9)	2,480.77 (6,425.2)	9,062.22 (23,471.1)	2,226.57 (5,766.8)	9,447.28 (24,468.4)	2,446.93 (6,337.5)	7,289.92 (18,880.8)	1,782.05 (4,615.5)	15,569.90 (40,325.9)	3,297.72 (8,541.1)
	Bayside Seascape Character Areas:														
	Bayside Commercial Park											0.29 (0.7)	0.00 (0.0)	0.44 (1.1)	0.00 (0.0)
	Bayside Industrial											3.74 (9.7)	0.05 (0.1)	5.74 (14.9)	0.05 (0.1)
	Bayside Industrial Resource											0.28 (0.7)	0.08 (0.2)	0.42 (1.1)	0.08 (0.2)
	Bayside Natural Upland							2.90 (7.5)	0.00 (0.0)	2.06 (5.3)		11.10 (28.8)	0.19 (0.5)	13.81 (35.8)	0.20 (0.5)
	Bayside Natural Wetland							109.21 (282.9)	13.82 (35.8)	84.68 (219.3)		46.78 (121.2)	13.54 (35.1)	154.00 (398.8)	27.49 (71.2)
	Bayside Recreation							2.44 (6.3)	0.01 (0.0)	0.66 (1.7)		11.18 (29.0)	0.82 (2.1)	13.98 (36.2)	0.84 (2.2)
	Bayside Residential							28.93 (74.9)	0.16 (0.4)	17.25 (44.7)		48.63 (126.0)	1.01 (2.6)	71.73 (185.8)	1.25 (3.2)
	Bayside Urban							3.56 (9.2)	0.00 (0.0)	3.30 (8.5)		5.63 (14.6)	0.05 (0.1)	12.06 (31.2)	0.05 (0.1)
	Bayside Waterbodies							162.81 (421.7)	25.04 (64.8)	129.83 (336.3)		257.62 (667.2)	94.45 (244.6)	419.31 (1,086.0)	120.19 (311.3)
	Seascape Residential							2.05 (5.3)	0.00 (0.0)	1.70 (4.4)		7.46 (19.3)	0.01 (0.0)	9.04 (23.4)	0.01 (0.0)
	Seascape Urban							0.02 (0.0)	0.00 (0.0)	0.02 (0.0)		1.37 (3.6)		1.39 (3.6)	0.00 (0.0)
	Oceanside Seascape Character Areas:														
	Nearshore Ocean					225.62 (584.4)	31.82 (82.4)	247.02 (639.8)	130.46 (337.9)	208.33 (539.6)		450.73 (1,167.4)	119.93 (310.6)	636.12 (1,647.5)	250.39 (648.5)
	Oceanside Beach							4.01 (10.4)	1.28 (3.3)	3.81 (9.9)		8.86 (22.9)	2.56 (6.6)	12.87 (33.3)	3.93 (10.2)
	Oceanside Recreation							0.01 (0.0)	0.00 (0.0)	0.01 (0.0)		6.95 (18.0)	2.35 (6.1)	6.97 (18.0)	2.37 (6.1)
	Oceanside Residential/Commercial							9.86 (25.5)	1.55 (4.0)	7.15 (18.5)		13.13 (34.0)	0.27 (0.7)	20.12 (52.1)	1.85 (4.8)
	Oceanside Urban							1.40 (3.6)	0.03 (0.1)	1.32 (3.4)		3.82 (9.9)	0.25 (0.7)	4.94 (12.8)	0.28 (0.7)
	Landscape Character Areas:														
	Inland Agriculture														
	Inland Commercial Park							10.08 (26.1)	0.00 (0.0)	1.76 (4.6)		28.29 (73.3)	0.01 (0.0)	38.16 (98.8)	0.01 (0.0)
	Inland Industrial											23.87 (61.8)	0.24 (0.6)	30.08 (77.9)	0.24 (0.6)
	Inland Industrial Resource											5.94 (15.4)	0.15 (0.4)	18.55 (48.0)	0.15 (0.4)
	Inland Natural Area							296.52 (768.0)	0.03 (0.1)	44.47 (115.2)		161.28 (417.7)	0.01 (0.0)	455.94 (1,180.9)	0.04 (0.1)

Scale of Change and Prominence Effects	Open Ocean, Seascape, and Landscape	One Project												Six Projects	
		OCS-A 0537		OCS-A 0538		OCS-A 0539		OCS-A 0541		OCS-A 0542		OCS-A 0544		New York Bight	
		Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Geographic Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)
	Inland Recreation											24.79 (64.2)	0.00 (0.0)	29.30 (75.9)	0.00 (0.0)
	Inland Suburban/Exurban Residential							131.92 (341.7)	0.00 (0.0)	39.31 (101.8)		569.25 (1,474.3)	0.03 (0.1)	691.83 (1,791.8)	0.14 (0.4)
	Inland Urban											122.51 (317.3)	0.07 (0.2)	157.39 (407.6)	0.07 (0.2)
Small Scale of Change and Prominence of 1 or 2	**Open Ocean Character Area:**														
	Open Ocean	9,416.28 (24,388.1)	3,267.06 (8,461.7)	9,681.22 (25,074.3)	3,158.14 (8,179.6)	9,957.53 (25,789.9)	3,083.03 (7,985.0)	9,062.22 (23,471.1)	2,852.34 (7,387.5)	9,447.28 (24,468.4)	3,099.92 (8,028.8)	7,289.92 (18,880.8)	2,130.04 (5,516.8)	15,569.90 (40,325.9)	3,443.52 (8,918.7)
	Seascape Character Areas:														
	Bayside Commercial Park			0.32 (0.8)	0.00 (0.0)	0.17 (0.4)	0.00 (0.0)	0.18 (0.5)	0.00 (0.0)	0.15 (0.4)	0.00 (0.0)	0.29 (0.7)		0.44 (1.1)	0.00 (0.0)
	Bayside Industrial							0.02 (0.1)	0.00 (0.0)	0.02 (0.1)	0.00 (0.0)	3.74 (9.7)	0.00 (0.0)	5.74 (14.9)	0.00 (0.0)
	Bayside Industrial Resource							0.14 (0.4)	0.00 (0.0)	0.14 (0.4)	0.00 (0.0)	0.28 (0.7)	0.03 (0.1)	0.42 (1.1)	0.03 (0.1)
	Bayside Military Site			0.29 (0.7)	0.04 (0.1)	0.29 (0.7)	0.03 (0.1)	0.27 (0.7)	0.03 (0.1)			0.58 (1.5)	0.03 (0.1)	0.58 (1.5)	0.04 (0.1)
	Bayside Natural Upland	1.49 (3.9)	0.01 (0.0)	2.53 (6.5)	0.00 (0.0)	2.72 (7.0)	0.00 (0.0)	2.90 (7.5)	0.01 (0.0)	2.06 (5.3)	0.00 (0.0)	11.10 (28.8)	0.23 (0.6)	13.81 (35.8)	0.24 (0.6)
	Bayside Natural Wetland	10.59 (27.4)	0.29 (0.8)	22.26 (57.7)	0.07 (0.2)	64.09 (166.0)	7.37 (19.1)	109.21 (282.9)	37.55 (97.3)	84.68 (219.3)	18.08 (46.8)	46.78 (121.2)	0.04 (0.1)	154.00 (398.8)	37.90 (98.1)
	Bayside Recreation	1.67 (4.3)	0.01 (0.0)	1.89 (4.9)	0.02 (0.0)	1.54 (4.0)	0.02 (0.0)	2.44 (6.3)	0.03 (0.1)	0.66 (1.7)	0.01 (0.0)	11.18 (29.0)	0.05 (0.1)	13.98 (36.2)	0.09 (0.2)
	Bayside Residential	3.72 (9.6)	0.10 (0.3)	21.24 (55.0)	0.12 (0.3)	24.86 (64.4)	0.29 (0.8)	28.93 (74.9)	0.42 (1.1)	17.25 (44.7)	0.19 (0.5)	48.63 (126.0)	0.08 (0.2)	71.73 (185.8)	0.59 (1.5)
	Bayside Urban	0.21 (0.5)	0.00 (0.0)	0.68 (1.8)	0.00 (0.0)	0.39 (1.0)	0.00 (0.0)	3.56 (9.2)	0.06 (0.2)	3.30 (8.5)	0.05 (0.1)	5.63 (14.6)	0.01 (0.0)	12.06 (31.2)	0.07 (0.2)
	Bayside Waterbodies	87.07 (225.5)	0.99 (2.6)	82.74 (214.3)	0.61 (1.6)	132.74 (343.8)	16.38 (42.4)	162.81 (421.7)	33.71 (87.3)	129.83 (336.3)	13.27 (34.4)	257.62 (667.2)	15.20 (39.4)	419.31 (1,086.0)	49.08 (127.1)
	Seascape Residential			3.50 (9.1)	0.02 (0.0)	2.33 (6.0)	0.01 (0.0)	2.05 (5.3)	0.02 (0.0)	1.70 (4.4)	0.01 (0.0)	7.46 (19.3)	0.00 (0.0)	9.04 (23.4)	0.03 (0.1)
	Seascape Urban			0.02 (0.0)	0.00 (0.0)	0.02 (0.0)	0.00 (0.0)	0.02 (0.0)		0.02 (0.0)	0.00 (0.0)	1.37 (3.6)		1.39 (3.6)	
	Oceanside Seascape Character Areas:														
	Nearshore Ocean	155.90 (403.8)	114.77 (297.3)	196.83 (509.8)	167.80 (434.6)	225.62 (584.4)	168.08 (435.3)	247.02 (639.8)	105.41 (273.0)	208.33 (539.6)	183.76 (475.9)	450.73 (1,167.4)	227.24 (588.6)	636.12 (1,647.5)	298.52 (773.2)
	Oceanside Beach	4.34 (11.2)	2.32 (6.0)	2.02 (5.2)	1.09 (2.8)	3.77 (9.8)	2.09 (5.4)	4.01 (10.4)	1.02 (2.6)	3.81 (9.9)	2.11 (5.5)	8.86 (22.9)	1.95 (5.1)	12.87 (33.3)	2.99 (7.7)
	Oceanside Recreation	1.75 (4.5)	0.63 (1.6)	0.01 (0.0)	0.00 (0.0)	0.01 (0.0)	0.00 (0.0)	0.01 (0.0)		0.01 (0.0)	0.00 (0.0)	6.95 (18.0)	0.43 (1.1)	6.97 (18.0)	0.43 (1.1)
	Oceanside Residential/Commercial	2.18 (5.7)	0.70 (1.8)	9.36 (24.3)	3.01 (7.8)	9.13 (23.6)	2.80 (7.3)	9.86 (25.5)	1.57 (4.1)	7.15 (18.5)	2.34 (6.1)	13.13 (34.0)	2.72 (7.0)	20.12 (52.1)	3.70 (9.6)
	Oceanside Urban			1.02 (2.6)	0.25 (0.6)	0.38 (1.0)	0.12 (0.3)	1.40 (3.6)	0.36 (0.9)	1.32 (3.4)	0.35 (0.9)	3.82 (9.9)	0.86 (2.2)	4.94 (12.8)	1.21 (3.1)
	Landscape Character Areas:														
	Inland Agriculture			0.37 (1.0)	0.00 (0.0)	0.35 (0.9)	0.00 (0.0)	1.63 (4.2)	0.01 (0.0)			19.64 (50.9)	0.00 (0.0)	21.27 (55.1)	0.01 (0.0)
	Inland Commercial Park	0.09 (0.2)	0.00 (0.0)	4.70 (12.2)	0.01 (0.0)	4.05 (10.5)	0.01 (0.0)	10.08 (26.1)	0.02 (0.1)	1.76 (4.6)	0.01 (0.0)	28.29 (73.3)	0.00 (0.0)	38.16 (98.8)	0.03 (0.1)
	Inland Industrial	0.02 (0.1)	0.00 (0.0)	0.28 (0.7)	0.00 (0.0)	0.67 (1.7)	0.00 (0.0)	5.09 (13.2)	0.00 (0.0)	0.27 (0.7)	0.00 (0.0)	23.87 (61.8)	0.00 (0.0)	30.08 (77.9)	0.01 (0.0)
	Inland Industrial Resource			2.66 (6.9)	0.00 (0.0)	6.04 (15.6)	0.01 (0.0)	12.67 (32.8)	0.07 (0.2)	2.85 (7.4)	0.00 (0.0)	5.94 (15.4)	0.05 (0.1)	18.55 (48.0)	0.12 (0.3)
	Inland Military Site							14.73 (38.1)	0.24 (0.6)					20.39 (52.8)	0.24 (0.6)
	Inland Natural Area	0.24 (0.6)	0.00 (0.0)	33.84 (87.6)	0.01 (0.0)	125.28 (324.5)	0.05 (0.1)	296.52 (768.0)	0.41 (1.0)	44.47 (115.2)	0.06 (0.2)	161.28 (417.7)	0.02 (0.0)	455.94 (1,180.9)	0.43 (1.1)
	Inland Recreation			1.64 (4.3)	0.00 (0.0)	0.52 (1.3)	0.00 (0.0)	2.66 (6.9)	0.06 (0.2)	0.84 (2.2)	0.02 (0.0)	24.79 (64.2)	0.02 (0.0)	29.30 (75.9)	0.08 (0.2)
	Inland Rural			0.68 (1.8)	0.00 (0.0)	2.66 (6.9)	0.00 (0.0)	20.29 (52.5)	0.01 (0.0)	0.54 (1.4)	0.00 (0.0)	5.31 (13.7)	0.11 (0.3)	25.60 (66.3)	0.11 (0.3)
	Inland Suburban/Exurban Residential	11.88 (30.8)	0.11 (0.3)	73.38 (190.1)	0.15 (0.4)	82.67 (214.1)	0.16 (0.4)	131.92 (341.7)	0.25 (0.6)	39.31 (101.8)	0.09 (0.2)	569.25 (1,474.3)	0.08 (0.2)	691.83 (1,791.8)	0.45 (1.2)
	Inland Urban			3.81 (9.9)	0.01 (0.0)	2.67 (6.9)	0.01 (0.0)	4.20 (10.9)	0.01 (0.0)			122.51 (317.3)	0.12 (0.3)	157.39 (407.6)	0.13 (0.3)

[1] Area measures represent totals by noticeable elements in the viewshed. Areas that are <0.00 sq miles (0.00 sq KM) are 0.64 acres or less.
km² = square kilometers

Table H-18. 853-foot WTGs scale of change and prominence for open ocean, seascape, and landscape[1]

Scale of Change and Prominence Effects	Open Ocean, Seascape, and Landscape	One Project												Six Projects	
		OCS-A 0537		OCS-A 0538		OCS-A 0539		OCS-A 0541		OCS-A 0542		OCS-A 0544		New York Bight	
		Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Geographic Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)
Large Scale of Change and Prominence of 5 or 6	**Open Ocean Character Area:**														
	Open Ocean	9,416.28 (24,388.1)	2,978.23 (7,713.6)	9,681.22 (25,074.3)	3,134.97 (8,119.5)	9,957.53 (25,789.9)	3,454.33 (8,946.7)	9,062.22 (23,471.1)	3,203.01 (8,295.8)	18,894.57 (48,936.7)	6,438.71 (16,676.2)	7,289.92 (18,880.8)	2,713.65 (7,028.3)	15,569.90 (40,325.9)	8,356.44 (21,643.1)
	Seascape Character Areas:														
	Bayside Waterbodies											257.62 (667.2)	0.00 (0.0)	419.31 (1,086.0)	0.00 (0.0)
	Nearshore Ocean											450.73 (1,167.4)	66.04 (171.1)	636.12 (1,647.5)	66.04 (171.1)
	Oceanside Beach											8.86 (22.9)	0.41 (1.1)	12.87 (33.3)	0.41 (1.1)
	Oceanside Recreation											6.95 (18.0)	0.18 (0.5)	6.97 (18.0)	0.18 (0.5)
	Oceanside Residential/Commercial											13.13 (34.0)	0.46 (1.2)	20.12 (52.1)	0.48 (1.2)
Medium Scale of Change and Prominence of 3 or 4	**Open Ocean Character Area:**														
	Open Ocean	9,416.28 (24,388.1)	507.07 (1,313.3)	9,681.22 (25,074.3)	461.62 (1,195.6)	9,957.53 (25,789.9)	448.55 (1,161.7)	9,062.22 (23,471.1)	480.04 (1,243.3)	18,894.57 (48,936.7)	874.63 (2,265.3)	7,289.92 (18,880.8)	367.05 (950.6)	15,569.90 (40,325.9)	776.94 (2,012.3)
	Seascape Character Areas:														
	Bayside Natural Wetland											46.78 (121.2)	0.75 (1.9)	154.00 (398.8)	0.75 (1.9)
	Bayside Residential											48.63 (126.0)	0.07 (0.2)	71.73 (185.8)	0.07 (0.2)
	Bayside Waterbodies											257.62 (667.2)	19.39 (50.2)	419.31 (1,086.0)	19.39 (50.2)
	Nearshore Ocean											450.73 (1,167.4)	34.41 (89.1)	636.12 (1,647.5)	34.41 (89.1)
	Oceanside Beach											8.86 (22.9)	0.70 (1.8)	12.87 (33.3)	0.70 (1.8)
	Oceanside Recreation											6.95 (18.0)	0.25 (0.6)	6.97 (18.0)	0.25 (0.6)
	Oceanside Residential/Commercial											13.13 (34.0)	0.20 (0.5)	20.12 (52.1)	0.21 (0.5)
Small Scale of Change and Prominence of 1 or 2	**Open Ocean Character Area:**														
	Open Ocean	9,416.28 (24,388.1)	2,913.06 (7,544.8)	9,681.22 (25,074.3)	2,958.82 (7,663.3)	9,957.53 (25,789.9)	2,965.50 (7,680.6)	9,062.22 (23,471.1)	2,648.01 (6,858.3)	18,894.57 (48,936.7)	5,936.68 (15,375.9)	7,289.92 (18,880.8)	2,145.98 (5,558.1)	15,569.90 (40,325.9)	3,829.50 (9,918.4)
	Bayside Seascape Character Areas:														
	Bayside Commercial Park			0.32 (0.8)	0.00 (0.0)	0.17 (0.4)	0.00 (0.0)	0.18 (0.5)	0.00 (0.0)	0.30 (0.8)	0.00 (0.0)	0.29 (0.7)	0.00 (0.0)	0.44 (1.1)	0.00 (0.0)
	Bayside Industrial							0.02 (0.1)	0.00 (0.0)	0.05 (0.1)		3.74 (9.7)	0.04 (0.1)	5.74 (14.9)	0.04 (0.1)
	Bayside Industrial Resource							0.14 (0.4)	0.00 (0.0)	0.28 (0.7)	0.00 (0.0)	0.28 (0.7)	0.11 (0.3)	0.42 (1.1)	0.11 (0.3)
	Bayside Military Site			0.29 (0.7)	0.00 (0.0)	0.29 (0.7)	0.00 (0.0)	0.27 (0.7)	0.00 (0.0)			0.58 (1.5)	0.00 (0.0)	0.58 (1.5)	0.00 (0.0)
	Bayside Natural Upland	1.49 (3.9)	0.00 (0.0)	2.53 (6.5)	0.00 (0.0)	2.72 (7.0)	0.00 (0.0)	2.90 (7.5)	0.00 (0.0)	4.13 (10.7)	0.00 (0.0)	11.10 (28.8)	0.19 (0.5)	13.81 (35.8)	0.19 (0.5)
	Bayside Natural Wetland	10.59 (27.4)	0.01 (0.0)	22.26 (57.7)	0.01 (0.0)	64.09 (166.0)	0.03 (0.1)	109.21 (282.9)	7.27 (18.8)	169.36 (438.6)	0.55 (1.4)	46.78 (121.2)	4.93 (12.8)	154.00 (398.8)	12.21 (31.6)
	Bayside Recreation	1.67 (4.3)	0.00 (0.0)	1.89 (4.9)	0.01 (0.0)	1.54 (4.0)	0.01 (0.0)	2.44 (6.3)	0.01 (0.0)	1.33 (3.4)	0.01 (0.0)	11.18 (29.0)	0.64 (1.7)	13.98 (36.2)	0.66 (1.7)
	Bayside Residential	3.72 (9.6)	0.01 (0.0)	21.24 (55.0)	0.02 (0.1)	24.86 (64.4)	0.04 (0.1)	28.93 (74.9)	0.13 (0.3)	34.49 (89.3)	0.04 (0.1)	48.63 (126.0)	0.77 (2.0)	71.73 (185.8)	0.93 (2.4)
	Bayside Urban	0.21 (0.5)	0.00 (0.0)	0.68 (1.8)	0.00 (0.0)	0.39 (1.0)	0.00 (0.0)	3.56 (9.2)	0.03 (0.1)	6.60 (17.1)	0.02 (0.0)	5.63 (14.6)	0.03 (0.1)	12.06 (31.2)	0.06 (0.2)
	Bayside Waterbodies	87.07 (225.5)	0.00 (0.0)	82.74 (214.3)	0.01 (0.0)	132.74 (343.8)	0.82 (2.1)	162.81 (421.7)	5.70 (14.8)	259.66 (672.5)	0.03 (0.1)	257.62 (667.2)	61.96 (160.5)	419.31 (1,086.0)	68.07 (176.3)
	Seascape Residential			3.50 (9.1)	0.01 (0.0)	2.33 (6.0)	0.00 (0.0)	2.05 (5.3)	0.01 (0.0)	3.40 (8.8)	0.01 (0.0)	7.46 (19.3)	0.00 (0.0)	9.04 (23.4)	0.03 (0.1)
	Seascape Urban			0.02 (0.0)	0.00 (0.0)	0.02 (0.0)	0.00 (0.0)	0.02 (0.0)	0.00 (0.0)	0.04 (0.1)	0.00 (0.0)	1.37 (3.6)		1.39 (3.6)	0.00 (0.0)
	Oceanside Seascape Character Areas:														
	Nearshore Ocean	155.90 (403.8)	0.00 (0.0)	196.83 (509.8)	1.42 (3.7)	225.62 (584.4)	85.26 (220.8)	247.02 (639.8)	158.56 (410.7)	416.65 (1,079.1)	41.90 (108.5)	450.73 (1,167.4)	129.32 (334.9)	636.12 (1,647.5)	287.88 (745.6)
	Oceanside Beach	4.34 (11.2)	0.06 (0.2)	2.02 (5.2)	0.80 (2.1)	3.77 (9.8)	1.23 (3.2)	4.01 (10.4)	2.10 (5.4)	7.62 (19.7)	1.71 (4.4)	8.86 (22.9)	2.81 (7.3)	12.87 (33.3)	4.98 (12.9)
	Oceanside Recreation	1.75 (4.5)	0.00 (0.0)	0.01 (0.0)	0.00 (0.0)	0.01 (0.0)	0.00 (0.0)	0.01 (0.0)	0.00 (0.0)	0.03 (0.1)	0.00 (0.0)	6.95 (18.0)	2.23 (5.8)	6.97 (18.0)	2.23 (5.8)

Scale of Change and Prominence Effects	Open Ocean, Seascape, and Landscape	One Project												Six Projects	
		OCS-A 0537		OCS-A 0538		OCS-A 0539		OCS-A 0541		OCS-A 0542		OCS-A 0544		New York Bight	
		Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Project Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)	Geographic Analysis Area Square Miles (km²)	Impact Area Square Miles (km²)
	Oceanside Residential/Commercial	2.18 (5.7)	0.05 (0.1)	9.36 (24.3)	0.82 (2.1)	9.13 (23.6)	1.94 (5.0)	9.86 (25.5)	2.21 (5.7)	14.30 (37.0)	3.04 (7.9)	13.13 (34.0)	0.90 (2.3)	20.12 (52.1)	3.25 (8.4)
	Oceanside Urban			1.02 (2.6)	0.06 (0.2)	0.38 (1.0)	0.09 (0.2)	1.40 (3.6)	0.21 (0.5)	2.63 (6.8)	0.09 (0.2)	3.82 (9.9)	0.76 (2.0)	4.94 (12.8)	0.98 (2.5)
	Landscape Character Areas:														
	Inland Agriculture			0.37 (1.0)	0.00 (0.0)	0.35 (0.9)	0.00 (0.0)	1.63 (4.2)	0.00 (0.0)			19.64 (50.9)	0.00 (0.0)	21.27 (55.1)	0.00 (0.0)
	Inland Commercial Park	0.09 (0.2)	0.00 (0.0)	4.70 (12.2)	0.00 (0.0)	4.05 (10.5)	0.00 (0.0)	10.08 (26.1)	0.01 (0.0)	3.52 (9.1)	0.01 (0.0)	28.29 (73.3)	0.00 (0.0)	38.16 (98.8)	0.02 (0.1)
	Inland Industrial	0.02 (0.1)	0.00 (0.0)	0.28 (0.7)	0.00 (0.0)	0.67 (1.7)	0.00 (0.0)	5.09 (13.2)	0.00 (0.0)	0.54 (1.4)	0.00 (0.0)	23.87 (61.8)	0.05 (0.1)	30.08 (77.9)	0.05 (0.1)
	Inland Industrial Resource			2.66 (6.9)	0.00 (0.0)	6.04 (15.6)	0.00 (0.0)	12.67 (32.8)	0.05 (0.1)	5.71 (14.8)	0.00 (0.0)	5.94 (15.4)	0.16 (0.4)	18.55 (48.0)	0.21 (0.6)
	Inland Military Site							14.73 (38.1)	0.00 (0.0)			5.67 (14.7)		20.39 (52.8)	0.00 (0.0)
	Inland Natural Area	0.24 (0.6)	0.00 (0.0)	33.84 (87.6)	0.01 (0.0)	125.28 (324.5)	0.01 (0.0)	296.52 (768.0)	0.07 (0.2)	88.95 (230.4)	0.01 (0.0)	161.28 (417.7)	0.02 (0.0)	455.94 (1,180.9)	0.09 (0.2)
	Inland Recreation			1.64 (4.3)	0.00 (0.0)	0.52 (1.3)	0.00 (0.0)	2.66 (6.9)	0.01 (0.0)	1.68 (4.3)	0.00 (0.0)	24.79 (64.2)	0.01 (0.0)	29.30 (75.9)	0.02 (0.1)
	Inland Rural			0.68 (1.8)	0.00 (0.0)	2.66 (6.9)	0.00 (0.0)	20.29 (52.5)	0.00 (0.0)	1.08 (2.8)	0.00 (0.0)	5.31 (13.7)	0.03 (0.1)	25.60 (66.3)	0.04 (0.1)
	Inland Suburban/Exurban Residential	11.88 (30.8)	0.04 (0.1)	73.38 (190.1)	0.08 (0.2)	82.67 (214.1)	0.08 (0.2)	131.92 (341.7)	0.11 (0.3)	78.62 (203.6)	0.06 (0.2)	569.25 (1,474.3)	0.08 (0.2)	691.83 (1,791.8)	0.31 (0.8)
	Inland Urban			3.81 (9.9)	0.00 (0.0)	2.67 (6.9)	0.00 (0.0)	4.20 (10.9)	0.00 (0.0)			122.51 (317.3)	0.13 (0.3)	157.39 (407.6)	0.14 (0.4)

[1] Area measures represent totals by noticeable elements in the viewshed. Areas that are <0.00 sq miles (0.00 sq KM) are 0.64 acres or less.
km² = square kilometers

H.3.1.4 Open Ocean, Seascape, and Landscape Impact Assessment Summary and Impact Levels

Table H-19 through Table H-32 summarize the effects from the offshore components of each lease area and all six NY Bight lease areas on sensitivity, magnitude, and visibility thresholds (Table H-8). The tables also present the impact levels for each character area based on the impact level definitions in Table H-8.

Lease areas farther from shore (i.e., OCS-A 0537 and OCS-A 0538) have less effect on seascape and landscape character areas because of their smaller perceptive scale, whereas lease areas nearer to shore (i.e., OCS-A 0544) have a greater perceptive scale and therefore a greater effect on oceanside seascape character type sense of place in limited areas of New York.

High to moderate magnitudes of visual impact would occur in the ocean-facing and bay-facing seascape character areas and diminish to moderate and minor as distance increases and screening effects increase from topography, structures, and vegetation. Nearshore Ocean is the largest and most vulnerable character area to change, outside of the Open Ocean. Medium to minor size or scale changes to character type sense of place would occur in all other seascape and landscape character areas. Impacts of the NY Bight projects on open ocean character, seascape character, and landscape character range from **negligible** to **major**.

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Table H-19. Open ocean, seascape, and landscape character SLIA summary for OCS-A 0537 for 1,312 WTGs

	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
Character Area	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	OCS-A 0537	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Seascape																					
Bayside Commercial Park			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial Resource			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Military Site			X		X				X			--		X					X	Negligible	Same as Alternative B
Bayside Natural Upland	X			X			X					--		X					X	Negligible	Same as Alternative B
Bayside Natural Wetland	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Recreation	X			X			X					--		X					X	Negligible	Same as Alternative B
Bayside Residential	X			X			X					•		X				X		Negligible	Same as Alternative B
Bayside Urban			X	X					X			--		X					X	Negligible	Same as Alternative B
Bayside Waterbodies	X			X			X					X		X				X		Minor	Same as Alternative B
Seascape Residential	X			X			X					--		X					X	Negligible	Same as Alternative B
Seascape Urban			X	X					X			--		X					X	Negligible	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Beach	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Recreation	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Residential/ Commercial		X		X				X				X		X				X		Minor	Same as Alternative B
Oceanside Urban		X		X				X				--		X					X	Negligible	Same as Alternative B
Landscape																					
Inland Agriculture		X		X				X				--		X					X	Negligible	Same as Alternative B
Inland Commercial Park			X			X			X			--		X					X	Negligible	Same as Alternative B
Inland Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Inland Industrial Resource		X				X		X				--		X					X	Negligible	Same as Alternative B
Inland Military Site		X			X			X				--		X					X	Negligible	Same as Alternative B
Inland Natural Area	X			X			X					--		X					X	Negligible	Same as Alternative B
Inland Recreation	X			X			X					--		X					X	Negligible	Same as Alternative B
Inland Rural	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Suburban/ Exurban Residential	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Urban			X		X				X			--		X					X	Negligible	Same as Alternative B

[1] • = <0.64 acre, -- = not visible

Table H-20. Open ocean, seascape, and landscape character SLIA summary for OCS-A 0538 for 1,312 WTGs

	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
Character Area	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	OCS-A 0538	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Seascape																					
Bayside Commercial Park			X			X			X			X		X				X		Minor	Same as Alternative B
Bayside Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial Resource			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Military Site			X		X				X			X		X				X		Minor	Same as Alternative B
Bayside Natural Upland	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Natural Wetland	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Recreation	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Residential	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Urban			X	X					X			X		X				X		Minor	Same as Alternative B
Bayside Waterbodies	X			X			X					X		X				X		Minor	Same as Alternative B
Seascape Residential	X			X			X					X		X				X		Minor	Same as Alternative B
Seascape Urban			X	X					X			X		X				X		Minor	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Beach	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Recreation	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Residential/ Commercial		X		X				X				X		X				X		Minor	Same as Alternative B
Oceanside Urban		X		X				X				X		X				X		Minor	Same as Alternative B
Landscape																					
Inland Agriculture		X		X				X				--		X					X	Negligible	Same as Alternative B
Inland Commercial Park			X			X			X			•		X					X	Negligible	Same as Alternative B
Inland Industrial			X			X			X			•		X					X	Negligible	Same as Alternative B
Inland Industrial Resource		X				X		X				•		X					X	Negligible	Same as Alternative B
Inland Military Site		X			X			X				--		X					X	Negligible	Same as Alternative B
Inland Natural Area	X			X			X					•		X					X	Negligible	Same as Alternative B
Inland Recreation	X			X			X					•		X					X	Negligible	Same as Alternative B
Inland Rural	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Suburban/ Exurban Residential	X				X		X					X		X				X		Minor	Same as Alternative B
Inland Urban			X		X				X			•		X						Negligible	Same as Alternative B

[1] • = <0.64 acre, -- = not visible

Table H-21. Open ocean, seascape, and landscape character SLIA summary for OCS-A 0539 for 1,312 WTGs

Character Area	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	OCS-A 0539	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Seascape																					
Bayside Commercial Park			X			X			X			•		X					X	Negligible	Same as Alternative B
Bayside Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial Resource			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Military Site			X		X				X			--		X					X	Negligible	Same as Alternative B
Bayside Natural Upland	X			X			X					•		X					X	Negligible	Same as Alternative B
Bayside Natural Wetland	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Recreation	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Residential	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Urban			X	X					X			•		X					X	Negligible	Same as Alternative B
Bayside Waterbodies	X			X			X					X		X				X		Minor	Same as Alternative B
Seascape Residential	X			X			X					X		X				X		Minor	Same as Alternative B
Seascape Urban			X	X					X			X		X				X		Minor	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Beach	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Recreation	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Residential/Commercial		X		X				X				X		X				X		Minor	Same as Alternative B
Oceanside Urban		X		X				X				X		X				X		Minor	Same as Alternative B
Landscape																					
Inland Agriculture		X		X				X				--		X					X	Negligible	Same as Alternative B
Inland Commercial Park			X			X			X			•		X					X	Negligible	Same as Alternative B
Inland Industrial			X			X			X			•		X					X	Negligible	Same as Alternative B
Inland Industrial Resource		X				X		X				•		X					X	Negligible	Same as Alternative B
Inland Military Site		X			X			X				--		X					X	Negligible	Same as Alternative B
Inland Natural Area	X			X			X					•		X					X	Negligible	Same as Alternative B
Inland Recreation	X			X			X					•		X					X	Negligible	Same as Alternative B
Inland Rural	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Suburban/ Exurban Residential	X				X		X					X		X				X		Minor	Same as Alternative B
Inland Urban			X		X				X			•		X					X	Negligible	Same as Alternative B

[1] • = <0.64 acre, -- = not visible

Table H-22. Open ocean, seascape, and landscape character SLIA summary for OCS-A 0541 for 1,312 WTGs

	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
Character Area	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)[1]	Low (1–2)	Unseen	OCS-A 0541	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Seascape																					
Bayside Commercial Park			X			X			X			•		X				X		Negligible	Same as Alternative B
Bayside Industrial			X			X			X			•		X				X		Negligible	Same as Alternative B
Bayside Industrial Resource			X			X			X			•		X				X		Negligible	Same as Alternative B
Bayside Military Site			X		X				X			--		X					X	Negligible	Same as Alternative B
Bayside Natural Upland	X			X			X					X		X			•	X		Minor	Same as Alternative B
Bayside Natural Wetland	X			X			X				X			X			X			Moderate	Same as Alternative B
Bayside Recreation	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Residential	X			X			X				X			X			•	X		Minor	Same as Alternative B
Bayside Urban			X	X					X			X		X			•	X		Minor	Same as Alternative B
Bayside Waterbodies	X			X			X				X			X			X			Moderate	Same as Alternative B
Seascape Residential	X			X			X					X		X				X		Minor	Same as Alternative B
Seascape Urban			X	X					X			•		X					X	Negligible	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X					X		X			X			Moderate	Same as Alternative B
Oceanside Beach	X			X			X					X		X			X			Moderate	Same as Alternative B
Oceanside Recreation	X			X			X					•		X			•	X		Minor	Same as Alternative B
Oceanside Residential/Commercial		X		X				X				X		X				X		Minor	Same as Alternative B
Oceanside Urban		X		X				X				X		X				X		Minor	Same as Alternative B
Landscape																					
Inland Agriculture		X		X				X				X		X				X		Minor	Same as Alternative B
Inland Commercial Park			X			X			X			X		X				X		Minor	Same as Alternative B
Inland Industrial			X			X			X			•		X					X	Negligible	Same as Alternative B
Inland Industrial Resource		X				X		X				X		X				X		Minor	Same as Alternative B
Inland Military Site		X			X			X				X		X				X		Minor	Same as Alternative B
Inland Natural Area	X			X			X					X		X			•	X		Minor	Same as Alternative B
Inland Recreation	X			X			X					X		X				X		Minor	Same as Alternative B
Inland Rural	X				X		X					•		X					X	Negligible	Same as Alternative B
Inland Suburban/ Exurban Residential	X				X		X					X		X			•	X		Minor	Same as Alternative B
Inland Urban			X		X				X			•		X					X	Negligible	Same as Alternative B

[1] • = <0.64 acre, -- = not visible

Table H-23. Open ocean, seascape, and landscape character SLIA summary for OCS-A 0542 for 1,312 WTGs

Character Area	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5-6)	Moderate (3-4)	Low (1-2)	Unseen	OCS-A 0542	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Seascape																					
Bayside Commercial Park			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial Resource			X			X			X			•		X				X		Minor	Same as Alternative B
Bayside Military Site			X		X				X			--		X					X	Negligible	Same as Alternative B
Bayside Natural Upland	X			X			X					•		X				X		Minor	Same as Alternative B
Bayside Natural Wetland	X			X			X				X			X				X		Minor	Same as Alternative B
Bayside Recreation	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Residential	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Urban			X	X					X			X		X				X		Minor	Same as Alternative B
Bayside Waterbodies	X			X			X				X			X				X		Minor	Same as Alternative B
Seascape Residential	X			X			X					X		X				X		Minor	Same as Alternative B
Seascape Urban			X	X					X			•		X				X		Minor	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Beach	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Recreation	X			X			X					•		X				X		Minor	Same as Alternative B
Oceanside Residential/Commercial		X		X				X				X		X				X		Minor	Same as Alternative B
Oceanside Urban		X		X				X				X		X				X		Minor	Same as Alternative B
Landscape																					
Inland Agriculture		X		X				X				--		X					X	Negligible	Same as Alternative B
Inland Commercial Park			X			X			X			•		X				X		Minor	Same as Alternative B
Inland Industrial			X			X			X			•		X				X		Minor	Same as Alternative B
Inland Industrial Resource		X				X		X				•		X				X		Minor	Same as Alternative B
Inland Military Site		X			X			X				--		X					X	Negligible	Same as Alternative B
Inland Natural Area	X			X			X					X		X				X		Minor	Same as Alternative B
Inland Recreation	X			X			X					--		X					X	Negligible	Same as Alternative B
Inland Rural	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Suburban/ Exurban Residential	X				X		X					X		X				X		Minor	Same as Alternative B
Inland Urban			X		X				X			--		X					X	Negligible	Same as Alternative B

[1] • = <0.64 acre, -- = not visible

Table H-24. Open ocean, seascape, and landscape character SLIA summary for OCS-A 0544 for 1,312 WTGs

Character Area	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5-6)[1]	Moderate (3-4)[1]	Low (1-2)	Unseen	OCS-A 0544	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Seascape																					
Bayside Commercial Park			X			X			X			•		X			•	X		Minor	Same as Alternative B
Bayside Industrial			X			X			X			X		X			X			Minor	Same as Alternative B
Bayside Industrial Resource			X			X			X			X		X			X			Minor	Same as Alternative B
Bayside Military Site			X		X				X			X		X				X		Negligible	Same as Alternative B
Bayside Natural Upland	X			X			X					X		X			•	X		Minor	Same as Alternative B
Bayside Natural Wetland	X			X			X				X			X		•	X			Moderate	Same as Alternative B
Bayside Recreation	X			X			X					X		X			•	X		Minor	Same as Alternative B
Bayside Residential	X			X			X					X		X			X			Moderate	Same as Alternative B
Bayside Urban			X	X					X			X		X			•	X		Minor	Same as Alternative B
Bayside Waterbodies	X			X			X			X				X		X				Major	Same as Alternative B
Seascape Residential	X			X			X					X		X				X		Minor	Same as Alternative B
Seascape Urban			X	X					X			--		X					X	Negligible	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Oceanside Beach	X			X			X					X		X		•	X			Moderate	Same as Alternative B
Oceanside Recreation	X			X			X					X		X		•	X			Moderate	Same as Alternative B
Oceanside Residential/Commercial		X		X				X			X			X		X				Moderate	Same as Alternative B
Oceanside Urban		X		X				X			X			X			X			Moderate	Same as Alternative B
Landscape																					
Inland Agriculture		X		X				X				•		X				X		Negligible	Same as Alternative B
Inland Commercial Park			X			X			X			•		X			X			Minor	Same as Alternative B
Inland Industrial			X			X			X			•		X			X			Minor	Same as Alternative B
Inland Industrial Resource		X				X		X				•		X			X			Minor	Same as Alternative B
Inland Military Site		X			X			X				--		X					X	Negligible	Same as Alternative B
Inland Natural Area	X			X			X					•		X				X		Negligible	Same as Alternative B
Inland Recreation	X			X			X					X		X				X		Minor	Same as Alternative B
Inland Rural	X				X		X					•		X				X		Negligible	Same as Alternative B
Inland Suburban/ Exurban Residential	X				X		X					•		X				X		Negligible	Same as Alternative B
Inland Urban			X		X				X			•		X				X		Negligible	Same as Alternative B

[1] • = <0.64 acre; -- = not visible

Table H-25. Open ocean, seascape, and landscape character SLIA summary for six NY Bight Projects for 1,312-foot WTGs

	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
Character Area	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	Six Projects	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Bayside Seascape																					
Bayside Commercial Park			X			X			X			•		X					X	Negligible	Same as Alternative B
Bayside Industrial			X			X			X			X		X				X		Negligible	Same as Alternative B
Bayside Industrial Resource			X			X			X			X		X				X		Minor	Same as Alternative B
Bayside Military Site			X		X				X			X		X				X		Minor	Same as Alternative B
Bayside Natural Upland	X			X				X				X		X				X		Minor	Same as Alternative B
Bayside Natural Wetland	X			X			X			X				X		X				Major	Same as Alternative B
Bayside Recreation	X			X				X				X		X				X		Minor	Same as Alternative B
Bayside Residential	X			X				X				X		X				X		Minor	Same as Alternative B
Bayside Urban			X	X					X			X		X				X		Minor	Same as Alternative B
Bayside Waterbodies	X			X			X			X				X			X			Moderate	Same as Alternative B
Seascape Residential	X			X				X				X		X				X		Minor	Same as Alternative B
Seascape Urban			X	X					X			•		X					X	Negligible	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Oceanside Beach	X			X			X			X				X		X				Major	Same as Alternative B
Oceanside Recreation	X			X			X			X				X			X			Moderate	Same as Alternative B
Oceanside Residential/Commercial		X		X				X			X			X			X			Moderate	Same as Alternative B
Oceanside Urban		X		X				X			X			X			X	X		Moderate	Same as Alternative B
Landscape																					
Inland Agriculture		X		X					X			X		X				X		Minor	Same as Alternative B
Inland Commercial Park			X			X			X			X		X				X		Minor	Same as Alternative B
Inland Industrial			X			X			X			X		X				X		Minor	Same as Alternative B
Inland Industrial Resource		X				X		X				X		X				X		Minor	Same as Alternative B
Inland Military Site		X			X			X				X		X				X		Minor	Same as Alternative B
Inland Natural Area	X			X				X				X		X				X		Minor	Same as Alternative B
Inland Recreation	X			X				X				X		X				X		Minor	Same as Alternative B
Inland Rural	X				X			X				X		X				X		Minor	Same as Alternative B
Inland Suburban/Exurban Residential	X				X			X				X		X				X		Minor	Same as Alternative B
Inland Urban			X		X				X			X		X				X		Minor	Same as Alternative B

[1] • = <0.64 acre;

Table H-26. Open ocean, seascape, and landscape character SLIA summary for OCS-A 0537 for 853-foot WTGs

	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
Character Area	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	OCS-A 0537	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Seascape																					
Bayside Commercial Park			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial Resource			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Military Site			X		X				X			--		X					X	Negligible	Same as Alternative B
Bayside Natural Upland	X			X				X				--		X					X	Negligible	Same as Alternative B
Bayside Natural Wetland	X			X			X					--		X					X	Negligible	Same as Alternative B
Bayside Recreation	X			X				X				--		X					X	Negligible	Same as Alternative B
Bayside Residential	X			X				X				--		X					X	Negligible	Same as Alternative B
Bayside Urban			X	X					X			--		X					X	Negligible	Same as Alternative B
Bayside Waterbodies	X			X			X					--		X					X	Negligible	Same as Alternative B
Seascape Residential	X			X				X				--		X					X	Negligible	Same as Alternative B
Seascape Urban			X	X					X			--		X					X	Negligible	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X					--		X					X	Negligible	Same as Alternative B
Oceanside Beach	X			X			X					--		X					X	Negligible	Same as Alternative B
Oceanside Recreation	X			X			X					--		X					X	Negligible	Same as Alternative B
Oceanside Residential/Commercial		X		X				X				--		X					X	Negligible	Same as Alternative B
Oceanside Urban		X		X				X				--		X					X	Negligible	Same as Alternative B
Landscape																					
Inland Agriculture		X		X				X				--		X					X	Negligible	Same as Alternative B
Inland Commercial Park			X			X			X			--		X					X	Negligible	Same as Alternative B
Inland Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Inland Industrial Resource		X				X		X				--		X					X	Negligible	Same as Alternative B
Inland Military Site		X			X			X				--		X					X	Negligible	Same as Alternative B
Inland Natural Area	X			X			X					--		X					X	Negligible	Same as Alternative B
Inland Recreation	X			X			X					--		X					X	Negligible	Same as Alternative B
Inland Rural	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Suburban/Exurban Residential	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Urban			X		X				X			--		X					X	Negligible	Same as Alternative B

[1] -- = not visible

Table H-27. Open ocean, seascape, and landscape character SLIA summary for OCS-A 0538 for 853-foot WTGs

Character Area	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	OCS-A 0538	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Seascape																					
Bayside Commercial Park			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial Resource			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Military Site			X		X				X			--		X					X	Negligible	Same as Alternative B
Bayside Natural Upland	X			X				X				--		X					X	Negligible	Same as Alternative B
Bayside Natural Wetland	X			X			X					--		X					X	Negligible	Same as Alternative B
Bayside Recreation	X			X				X				--		X					X	Negligible	Same as Alternative B
Bayside Residential	X			X				X				--		X					X	Negligible	Same as Alternative B
Bayside Urban			X	X					X			--		X					X	Negligible	Same as Alternative B
Bayside Waterbodies	X			X			X					--		X					X	Negligible	Same as Alternative B
Seascape Residential	X			X				X				--		X					X	Negligible	Same as Alternative B
Seascape Urban			X	X					X			--		X					X	Negligible	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X					--		X					X	Negligible	Same as Alternative B
Oceanside Beach	X			X			X					--		X					X	Negligible	Same as Alternative B
Oceanside Recreation	X			X			X					--		X					X	Negligible	Same as Alternative B
Oceanside Residential/Commercial		X		X				X				--		X					X	Negligible	Same as Alternative B
Oceanside Urban		X		X				X				--		X					X	Negligible	Same as Alternative B
Landscape																					
Inland Agriculture		X		X				X				--		X					X	Negligible	Same as Alternative B
Inland Commercial Park			X			X			X			--		X					X	Negligible	Same as Alternative B
Inland Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Inland Industrial Resource		X				X		X				--		X					X	Negligible	Same as Alternative B
Inland Military Site		X			X			X				--		X					X	Negligible	Same as Alternative B
Inland Natural Area	X			X			X					--		X					X	Negligible	Same as Alternative B
Inland Recreation	X			X			X					--		X					X	Negligible	Same as Alternative B
Inland Rural	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Suburban/Exurban Residential	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Urban			X		X				X			--		X					X	Negligible	Same as Alternative B

[1] -- = not visible

Table H-28. Open ocean, seascape, and landscape character SLIA summary for OCS-A 0539 for 853-foot WTGs

	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
Character Area	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	OCS-A 0539	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Bayside Seascape																					
Bayside Commercial Park			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial Resource			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Military Site			X		X				X			--		X					X	Negligible	Same as Alternative B
Bayside Natural Upland	X			X				X				--		X					X	Negligible	Same as Alternative B
Bayside Natural Wetland	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Recreation	X			X				X				--		X					X	Negligible	Same as Alternative B
Bayside Residential	X			X				X				•		X					X	Negligible	Same as Alternative B
Bayside Urban			X	X					X			--		X					X	Negligible	Same as Alternative B
Bayside Waterbodies	X			X			X					X		X				X		Minor	Same as Alternative B
Seascape Residential	X			X				X				•		X					X	Negligible	Same as Alternative B
Seascape Urban			X	X					X			--		X					X	Negligible	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Beach	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Recreation	X			X			X					•		X					X	Negligible	Same as Alternative B
Oceanside Residential/Commercial		X		X				X				X		X				X		Minor	Same as Alternative B
Oceanside Urban		X		X				X				X		X				X		Minor	Same as Alternative B
Landscape																					
Inland Agriculture		X		X				X				--		X					X	Negligible	Same as Alternative B
Inland Commercial Park			X			X			X			--		X					X	Negligible	Same as Alternative B
Inland Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Inland Industrial Resource		X				X		X				--		X					X	Negligible	Same as Alternative B
Inland Military Site		X			X			X				--		X					X	Negligible	Same as Alternative B
Inland Natural Area	X			X			X					--		X					X	Negligible	Same as Alternative B
Inland Recreation	X			X			X					--		X					X	Negligible	Same as Alternative B
Inland Rural	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Suburban/Exurban Residential	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Urban			X		X				X			--		X					X	Negligible	Same as Alternative B

[1] • = <0.64 acre; -- = not visible

Table H-29. Open ocean, seascape, and landscape character SLIA summary for OCS-A 0541 for 853-foot WTGs

	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
Character Area	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	OCS-A 0541	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Seascape																					
Bayside Commercial Park			X			X			X			•		X					X	Negligible	Same as Alternative B
Bayside Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial Resource			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Military Site			X		X				X			--		X					X	Negligible	Same as Alternative B
Bayside Natural Upland	X			X				X				•		X					X	Negligible	Same as Alternative B
Bayside Natural Wetland	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Recreation	X			X				X				X		X				X		Minor	Same as Alternative B
Bayside Residential	X			X				X				X		X				X		Minor	Same as Alternative B
Bayside Urban			X	X					X			•		X					X	Negligible	Same as Alternative B
Bayside Waterbodies	X			X			X					X		X				X		Minor	Same as Alternative B
Seascape Residential	X			X				X				•		X					X	Negligible	Same as Alternative B
Seascape Urban			X	X					X			•		X					X	Negligible	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Beach	X			X			X					X		X				X		Minor	Same as Alternative B
Oceanside Recreation	X			X			X					•		X					X	Negligible	Same as Alternative B
Oceanside Residential/Commercial		X		X				X				X		X				X		Minor	Same as Alternative B
Oceanside Urban		X		X				X				X		X				X		Minor	Same as Alternative B
Landscape																					
Inland Agriculture		X		X				X				X		X				X		Minor	Same as Alternative B
Inland Commercial Park			X			X			X			•		X					X	Negligible	Same as Alternative B
Inland Industrial			X			X			X			•		X					X	Negligible	Same as Alternative B
Inland Industrial Resource		X				X		X				•		X					X	Negligible	Same as Alternative B
Inland Military Site		X			X			X				--		X					X	Negligible	Same as Alternative B
Inland Natural Area	X			X			X					X		X				X		Minor	Same as Alternative B
Inland Recreation	X			X			X					•		X					X	Negligible	Same as Alternative B
Inland Rural	X				X		X					•		X					X	Negligible	Same as Alternative B
Inland Suburban/ Exurban Residential	X				X		X					X		X				X		Minor	Same as Alternative B
Inland Urban			X		X				X			--		X					X	Negligible	Same as Alternative B

[1] • = <0.64 acre; -- = not visible

Table H-30. Open ocean, seascape, and landscape character SLIA summary for OCS-A 0542 for 853-foot WTGs

	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
Character Area	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	OCS-A 0542	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Seascape																					
Bayside Commercial Park			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Industrial Resource			X			X			X			--		X					X	Negligible	Same as Alternative B
Bayside Military Site			X		X				X			--		X					X	Negligible	Same as Alternative B
Bayside Natural Upland	X			X				X				--		X					X	Negligible	Same as Alternative B
Bayside Natural Wetland	X			X			X					--		X					X	Negligible	Same as Alternative B
Bayside Recreation	X			X				X				--		X					X	Negligible	Same as Alternative B
Bayside Residential	X			X				X				--		X					X	Negligible	Same as Alternative B
Bayside Urban			X	X					X			--		X					X	Negligible	Same as Alternative B
Bayside Waterbodies	X			X			X					--		X					X	Negligible	Same as Alternative B
Seascape Residential	X			X				X				--		X					X	Negligible	Same as Alternative B
Seascape Urban			X	X					X			--		X					X	Negligible	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X					--		X					X	Negligible	Same as Alternative B
Oceanside Beach	X			X			X					--		X					X	Negligible	Same as Alternative B
Oceanside Recreation	X			X			X					--		X					X	Negligible	Same as Alternative B
Oceanside Residential/Commercial		X		X				X				--		X					X	Negligible	Same as Alternative B
Oceanside Urban		X		X				X				--		X					X	Negligible	Same as Alternative B
Landscape																					
Inland Agriculture		X		X				X				--		X					X	Negligible	Same as Alternative B
Inland Commercial Park			X			X			X			--		X					X	Negligible	Same as Alternative B
Inland Industrial			X			X			X			--		X					X	Negligible	Same as Alternative B
Inland Industrial Resource		X				X		X				--		X					X	Negligible	Same as Alternative B
Inland Military Site		X			X			X				--		X					X	Negligible	Same as Alternative B
Inland Natural Area	X			X			X					--		X					X	Negligible	Same as Alternative B
Inland Recreation	X			X			X					--		X					X	Negligible	Same as Alternative B
Inland Rural	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Suburban/Exurban Residential	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Urban			X		X				X			--		X					X	Negligible	Same as Alternative B

[1] -- = not visible

Table H-31. Open ocean, seascape, and landscape character SLIA summary for OCS-A 0544 for 853-foot WTGs

Character Area	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	OCS-A 0544	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Seascape																					
Bayside Commercial Park			X			X			X			•		X					X	Negligible	Same as Alternative B
Bayside Industrial			X			X			X			X		X				X		Negligible	Same as Alternative B
Bayside Industrial Resource			X			X			X			X		X				X		Negligible	Same as Alternative B
Bayside Military Site			X		X				X			--		X					X	Negligible	Same as Alternative B
Bayside Natural Upland	X			X				X				X		X				X		Minor	Same as Alternative B
Bayside Natural Wetland	X			X			X					X		X			X			Moderate	Same as Alternative B
Bayside Recreation	X			X				X				X		X				X		Minor	Same as Alternative B
Bayside Residential	X			X				X				X		X				X		Minor	Same as Alternative B
Bayside Urban			X	X					X			X		X				X		Negligible	Same as Alternative B
Bayside Waterbodies	X			X			X					--		X			X			Moderate	Same as Alternative B
Seascape Residential	X			X				X				•		X					X	Negligible	Same as Alternative B
Seascape Urban			X	X					X			--		X					X	Negligible	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Oceanside Beach	X			X			X				X			X			X			Moderate	Same as Alternative B
Oceanside Recreation	X			X			X					X		X			X	X		Moderate	Same as Alternative B
Oceanside Residential/Commercial		X		X				X				X		X			X	X		Moderate	Same as Alternative B
Oceanside Urban		X		X				X				X		X				X		Minor	Same as Alternative B
Landscape																					
Inland Agriculture		X		X				X				•		X					X	Negligible	Same as Alternative B
Inland Commercial Park			X			X			X			•		X					X	Negligible	Same as Alternative B
Inland Industrial			X			X			X			X		X				X		Minor	Same as Alternative B
Inland Industrial Resource		X				X		X				X		X				X		Minor	Same as Alternative B
Inland Military Site		X			X			X				--		X					X	Negligible	Same as Alternative B
Inland Natural Area	X			X			X					X		X				X		Minor	Same as Alternative B
Inland Recreation	X			X			X					X		X				X		Minor	Same as Alternative B
Inland Rural	X				X		X					--		X					X	Negligible	Same as Alternative B
Inland Suburban/Exurban Residential	X				X		X					X		X				X		Minor	Same as Alternative B
Inland Urban			X		X				X			X		X				X		Minor	Same as Alternative B

[1] • = <0.64 acre; -- = not visible

Table H-32. Open ocean, seascape, and landscape character SLIA summary for six NY Bight projects for 853-foot WTGs

	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Impact Levels	
	Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration								
Character Area	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small [1]	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	Six Projects	Alternative C
Open Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Bayside Seascape																					
Bayside Commercial Park			X			X			X			•		X					X	Negligible	Same as Alternative B
Bayside Industrial			X			X			X			X		X					X	Negligible	Same as Alternative B
Bayside Industrial Resource			X			X			X			X		X				X		Minor	Same as Alternative B
Bayside Military Site			X		X				X			X		X					X	Negligible	Same as Alternative B
Bayside Natural Upland	X			X				X				X		X				X		Minor	Same as Alternative B
Bayside Natural Wetland	X			X			X					X		X				X		Minor	Same as Alternative B
Bayside Recreation	X			X				X				X		X				X		Minor	Same as Alternative B
Bayside Residential	X			X				X				X		X				X		Minor	Same as Alternative B
Bayside Urban			X	X					X			X		X				X		Minor	Same as Alternative B
Bayside Waterbodies	X			X			X				X			X			X			Moderate	Same as Alternative B
Seascape Residential	X			X				X				X		X				X		Minor	Same as Alternative B
Seascape Urban			X	X					X			•		X					X	Negligible	Same as Alternative B
Oceanside Seascape																					
Nearshore Ocean	X			X			X			X				X		X				Major	Same as Alternative B
Oceanside Beach	X			X			X				X			X			X			Moderate	Same as Alternative B
Oceanside Recreation	X			X			X				X			X			X			Moderate	Same as Alternative B
Oceanside Residential/ Commercial		X		X				X			X			X			X			Moderate	Same as Alternative B
Oceanside Urban		X		X				X				X		X				X		Minor	Same as Alternative B
Landscape																					
Inland Agriculture		X		X					X			•		X					X	Negligible	Same as Alternative B
Inland Commercial Park			X			X			X			X		X				X		Minor	Same as Alternative B
Inland Industrial			X			X			X			X		X				X		Minor	Same as Alternative B
Inland Industrial Resource		X				X			X			X		X				X		Minor	Same as Alternative B
Inland Military Site		X			X				X			--		X					X	Negligible	Same as Alternative B
Inland Natural Area	X			X				X				X		X				X		Minor	Same as Alternative B
Inland Recreation	X			X				X				X		X				X		Minor	Same as Alternative B
Inland Rural	X				X				X			•		X					X	Negligible	Same as Alternative B
Inland Suburban/ Exurban Residential	X				X			X				X		X				X		Minor	Same as Alternative B
Inland Urban			X		X				X			X		X				X		Minor	Same as Alternative B

[1] • = <0.64 acre; -- = not visible

H.3.2 Visual Impact Assessment (VIA)

H.3.2.1 Sensitivity

Impacts on people are considered in evaluating KOPs. The susceptibility of viewers to changes in views is a function of the activities in which the viewers are engaged and their attention or interest on the view. Visual receptors most susceptible to change generally include residents with views of the proposed project from their homes, people engaged in outdoor recreation whose attention is focused on the views, visitors to historic or culturally important sites where views are an important contributor to the experience, people who regard the visual environment as an asset to their community, and people traveling scenic highways, railroads, or other transport specifically for enjoyment of the views.

KOPs are generally selected to represent high value, highly susceptible viewpoints to evaluate impacts at these special places; therefore, it is not surprising that all the KOPs are highly sensitive. Table H-33 documents the susceptibility, value, and sensitivity of viewers at each KOP. Overall, residents, tourists, and visitors engaging in recreation at these viewpoints are highly susceptible to changes from the NY Bight projects due to their interest in ocean-facing views and the visual environment being an important asset to their community. It is noted that susceptibility may be variable for visitors based on the activities people are engaged in and the nuances of each location. For example, visitors at Lucy the Elephant have a higher susceptibility while in the howdah and viewing the open ocean, and a lower susceptibility while on the ground or inside the structure. Many of the KOPs have special local, state, or national designations that demonstrate their value. For all the KOPs, their expansive ocean-facing views define their experiential character, which contributes to their overall view value.

Table H-33. View value, susceptibility, and viewer sensitivity for each KOP

KOP[1]	Viewer Experience								
	View Value			Receptor Susceptibility			Viewer Sensitivity		
	High	Medium	Low	High	Medium	Low	High	Medium	Low
KOP-02 Lucy the Elephant [1, 2]	X				X		X		
KOP-03 John Stafford Hall-Boardwalk [2]	X			X			X		
KOP-04 John Stafford Hall-Beach Entrance	X			X			X		
KOP-05 Jim Whelan Hall-Balcony [1, 2]	X				X		X		
KOP-06 Atlantic City Boardwalk-Ocean Casino Boardwalk View	X			X			X		
KOP-07 Atlantic City Boardwalk-Top of Ocean Casino [1]	X			X			X		
KOP-08A/B Beach Haven – daytime and nighttime [2]	X			X			X		
KOP-09 Barnegat Jetty	X			X			X		
KOP-10 Barnegat Lighthouse [1,2]	X			X			X		
KOP-11 US Life Saving Station #14 [1]	X			X			X		
KOP-12 Seaside Park Beach	X			X			X		

KOP[1]	View Value High	View Value Medium	View Value Low	Receptor Susceptibility High	Receptor Susceptibility Medium	Receptor Susceptibility Low	Viewer Sensitivity High	Viewer Sensitivity Medium	Viewer Sensitivity Low
KOP-13 Mantoloking [2]	X			X			X		
KOP-14 Bayhead	X			X			X		
KOP-15 Point Pleasant	X			X			X		
KOP-16 Ocean Grove	X			X			X		
KOP-17 Asbury Park Beach	X			X			X		
KOP-18 Allenhurst Residential Historic District [2]	X			X			X		
KOP-19 Navesink Twin Lights	X			X			X		
KOP-26 Fort Tilden [2]	X			X			X		
KOP-27 Magnolia Beach	X			X			X		
KOP-28 Jones Beach [2]	X			X			X		
KOP-29 Rudolph Oyster House	X					X	X		
KOP-30 Shinnecock Inlet [2]	X			X			X		
KOP-31 Westhampton Beach [2]	X			X			X		
KOP-32 Fire Island Lighthouse-Upper Deck [1, 2]	X			X			X		
KOP-33 Fire Island Lighthouse-Base	X			X			X		
KOP-35 Navesink Twin Lights Lighthouse [1, 2]	X			X			X		
KOP-36 Asbury Park Hall-Balcony [1, 2]	X			X			X		
KOP-37 Point O' Woods [2]	X			X			X		
KOP-38 Robert Moses Field 5	X			X			X		
KOP-39 Empire State Building Observation Deck [1, 2]	X			X			X		
KOP-40 Robert Moses Field-Nighttime [2]	X			X			X		
KOP-A Representative Recreational Fishing, Pleasure, and Tour Boat Area	X			X			X		
KOP-B Representative Commercial and Cruise Ship Shipping Lanes	X			X			X		

[1] Elevated viewpoint
[2] Simulation

H.3.2.2 Magnitude

The measure of magnitude of visual impacts is similar to that used for SLIA and is based on the size or scale of change, the geographic extent of its effects, and its duration and reversibility. Large-scale changes that introduce new, non-characteristic, discordant, or intrusive elements are more important than small changes or changes involving similar features already present within the view.

Size and scale of change and geographic extent is measured by a project's distances, horizontal FOVs, noticeable features based on their heights and EC, and visual contrasts. The analysis considers the introduction of WTGs and OSS to an open ocean baseline. The scale, size, contrast, and prominence of change focuses on the:

- Arrangement of WTGs and OSS in the view.
- Horizontal and vertical FOV scale of the wind turbine array, based on WTG and OSS size and number.
- Position of the array in the open ocean.
- Position of the array in the view.
- Wind turbine array's distance from the viewer.

Visibility, character-changing effects, scale, prominence, and visual contrasts reduce steadily with distance from the observation point, and increase with elevated observer positions in comparison with the wind turbine array. Distance and observer elevation considerations are informed by the visual simulations (BOEM's NY Bight website: https://www.boem.gov/renewable-energy/state-activities/new-york-bight), EC calculations, horizontal FOV, and vertical FOV in undeveloped open ocean. The wind turbine array and nearest WTGs would be:

- Unavoidably dominant features in the boat and ship ocean view between 0 and 5 miles (0 and 8.0 kilometers) distance.
- Strongly pervasive features in the onshore to offshore view between 5 and 16 miles (8 and 25.75 kilometers) distance.
- Clearly visible features in the onshore to offshore view between 16 and 20 miles (25.75 and 45.1 kilometers) distance.
- Low on the horizon, but persistent features in the onshore to offshore view between 20 and 36.1 miles (45.1 and 58.1 kilometers) distance.
- Intermittently noticed features in the onshore to offshore view between 36.1 and 47.4 miles (58.1 and 76.3 kilometers) distance.
- Below the horizon beyond 47.4 miles (76.3 kilometers) distance.

Construction and installation involving moving and stationary visual feature contrasts to forms, lines, colors, and textures, scale, and prominence in formerly open seascape may have more effect on viewers than operational and decommissioning impacts, where the viewing context is existing WTGs and OSSs. Construction impacts would be temporary and include:

- Daytime and nighttime movement of installation vessels, cranes, and other equipment visible in the seascape in and around the lease area.

- Dawn, dusk, and nighttime construction and installation lighting on WTGs and OSSs.
- Beach, other sensitive land-based, and boat and cruise ship views of WTGs and OSSs under construction and installation.

Foreground influence assessments, involving the presence of intervening or framing elements and their influence on effects of project characteristics, are based on each KOP's locale photography and visual simulations and summarized in Table H-34.

Table H-34. Foreground view framing and intervening elements between the KOPs and the lease areas

Foreground Element(s) Influence[1]	Offshore Key Observation Points
Open Ocean **Negligible Influence**	KOP-A Recreational Fishing, Pleasure, and Tour Boat Area KOP-B Commercial and Cruise Ship Shipping Lanes
Beach and Ocean **Minor Influence**	KOP-28 Jones Beach State Park KOP-31 Westhampton Beach KOP-36 Asbury Convention Hall Balcony KOP-11 US Life Saving Station #14 KOP-12 Seaside Beach Park KOP-17 Asbury Park Beach KOP-37 Point O' Woods
Dunes, Beach, and Ocean **Minor Influence**	KOP-3 Stafford Hall Boardwalk KOP-4 Stafford Hall Beach Entrance KOP-10 Barnegat Lighthouse KOP-18 Allenhurst KOP-30 Shinnecock Inlet KOP-14 Bayhead KOP-15 Point Pleasant KOP-16 Ocean Grove
Structures, Dunes, and Beach **Moderate Influence**	KOP-8A Beach Haven (daytime) KOP-8B Beach Haven (night) KOP-6 Atlantic City Boardwalk – Ocean Casino KOP-7 Ocean Casino – Top KOP-9 Barnegat Jetty KOP-27 Magnolia Beach KOP-33 Fire Island Lighthouse – Base KOP-38 Robert Moses Field 5 KOP-40 Robert Moses Field – Nighttime
Bay, Vegetation, Roadway, and Structures **Minor Influence**	KOP-32 Fire Island Lighthouse – Top
Landscape Structures, Vegetation, and Topography **Minor to Moderate Influence**	KOP-13 Mantoloking KOP-35 Navesink Twin Lights – Top
Bay, Landscape Structures, and Topography **Dominant/Major Influence**	KOP-29 Rudolph Oyster House (Long Island Maritime Museum)

Foreground Element(s) Influence[1]	Offshore Key Observation Points
Bay, Structures, and Roadways **Dominant/Major Influence**	KOP-39 Empire State Building
Vegetation, Roadway, and Topography **Dominant/Major Influence**	KOP-19 Navesink Twin Lights
Structures, Landscape Structures, Vegetation, and Topography **Minor to Moderate Influence**	KOP-26 Fort Tilden/Jacob Riis (night)
Structures, Dunes, Beach Structures, and Ocean **Dominant/Major Influence**	KOP-2 Lucy the Margate Elephant KOP-5 Jim Whelan KOP-35 Navesink Twin Lights Lighthouse – Top

[1] Based on conditions portrayed by representative photography contained in Argonne (2024). Nearby view receptor locations may vary from screened to open views of the lease area.

Visual contrast determinations on viewer experience are based on visual simulations for 17 representative KOPs (Argonne 2024). Potential viewpoints' evaluations range from faint to dominant. Visual contrast determinations involve comparisons of characteristics of the KOPs before and after implementation of the NY Bight projects. The range of potential contrasts includes strong, moderate, weak, and none. The strongest daytime contrasts would result from tranquil and flat seas combined with sunlit WTG towers, nacelles, flickering rotors, and the yellow tower 50-foot (15.2-meter) base color against a dark background sky and an undifferentiated foreground. The weakest daytime contrasts would result from turbulent seas combined with overcast daylight conditions on WTG towers, nacelles, and rotors against an overcast background sky and a foreground modulated by varied landscape elements. The strongest nighttime contrasts would result from dark skies (absent moonlight) combined with aviation lights, lighting on the OSS, mid-tower lights, and project lighting reflections on low clouds and active (non-reflective) surf, and the dark-sky light dome. The weakest nighttime contrasts would result from moonlit, cloudless skies; tranquil (reflective) seas; and aircraft detection lighting system (ADLS) activation (Alternative C).

There would be daily variation in WTG color contrast as sun angles change from backlit to front-lit (sunrise to sunset), and the backdrop would vary under different lighting and atmospheric conditions. Two sets of photo simulations were produced for selected KOPs. One set approximates the predictable visibility based on the atmospheric visual clarity at the time the photograph was taken. The other set approximates the maximum visibility potential with no visual interference from atmospheric conditions. Table H-35 identifies which KOPs are simulated and additional KOPs that use this simulation as a reference.

Visual contrast, scale of change, and prominence determinations for KOPs with simulations are listed in Table H-36 through Table H-41 for each lease area and the 1,312-foot (400-meter) and 853-foot (260-meter) WTGs, followed by Table H-42 and Table H-43 for the six projects and 1,312-foot (400-meter) and 853-foot (260-meter) WTGs, respectively.

Photo-simulations are instrumental when assessing visual impacts from KOPs. Table H-35 lists the KOPs with photo-simulations, as well as the KOPs without simulations that are similar in distance to the lease area WTGs as the KOPs with simulations and would represent similar level of visual impact. This table also lists KOPs initially identified for impact evaluation, but were found to be outside of the view of WTGs within any of the six NY Bight lease areas.

Table H-35. KOPs with simulations, KOPs represented by KOPs with simulations, and KOPs outside of view of the lease areas

KOPs with Simulations		KOPs Represented by the KOPs with Simulations	
KOP #[1]	KOP Name	KOP #	KOP Name
KOP-02	Lucy the Margate Elephant	n/a	n/a
KOP-04	John Stafford Beach Entrance	KOP-03	John Stafford Hall – Boardwalk
		KOP-06	Atlantic City Boardwalk Ocean Casino Boardwalk View
KOP-05	Jim Whelan Hall – Balcony	KOP-07	Atlantic City Boardwalk Top of Ocean Casino
KOP-08	Beach Haven (Day)	n/a	n/a
KOP-08	Beach Haven (Night)	n/a	n/a
KOP-10	Barnegat Lighthouse	n/a	n/a
KOP-13	Mantoloking	KOP-14	Bayhead
		KOP-15	Point Pleasant
KOP-18	Allenhurst Residential Historic District	KOP 16	Ocean Grove
		KOP 17	Asbury Park Beach
		KOP 19	Navesink Twin Lights (ground level)
KOP-26	Fort Tilden (Night)	n/a	n/a
KOP-28	Jones Beach	n/a	n/a
KOP-30	Shinnecock Inlet	n/a	n/a
KOP-31	Westhampton Beach	KOP-27	Magnolia Beach
KOP-32	Fire Island Lighthouse Upper Deck	n/a	n/a
KOP-35	Twin Lights Lighthouse	n/a	n/a
KOP-36	Asbury Park Hall – Top	n/a	n/a
KOP-37	Point O' Woods	KOP- 33	Fire Island Lighthouse (Base)
		KOP-38	Robert Moses Field #5 (Day)
KOP-39	Empire State Building	n/a	n/a
KOP-40	Robert Moses Field 5 (Night)	KOP-33	Fire Island Lighthouse (Base)[2]
		KOP-37	Point O'Woods[2]
KOPs without Simulation Representation (analysis based solely on GIS)			
KOP-09	Barnegat Jetty		
KOP-11	US Life Saving Station #14		
KOP-12	Seaside Park Beach		

[1] Eight KOPs were identified but following the analysis appeared outside of the affected viewshed and have been removed from the impact analysis. These are: KOP-01 Ocean City Music Hall, KOP-20 Sandy Hook Beach, KOP-21 Great Kills, KOP-22 Roosevelt Pier, KOP-23 Statue of Liberty – Upper Deck, KOP-24 Statue of Liberty – Base, KOP-25 Coney Island Boardwalk, and KOP-34 Sandy Hook Observatory.

[2] KOP 40 provides a representative example of nighttime effects for KOP-33 and KOP-37.

The following tables list the analytical results for the two different sets of simulations when the results are different at the respective KOPs. KOPs noted with results based on maximum visibility conditions are labeled with **MAXIMUM VISIBILITY** in the tables, and results on the predicted visibility based on the visual clarity at the time of the photo are labeled with **PREDICTED VISIBILITY**.

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Table H-36. 1,312-foot and 853-foot WTG NY Bight projects magnitude and impacts for OSC-A 0537

KOP	Distance in Miles (Kilometers) and Noticeable Elements[1] OCS-A 0537	New York Bight Visible FOV Degrees (% of 124°)	OCS-A 0537 Contrast, Scale of Change, and Prominence: Form	Line	Color	Texture	Scale	Prominence[2]	OSC-A 0537 Impact Level: 1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-02 Lucy the Elephant	97.4 (156.8) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-04 John Stafford Hall-Beach Entrance	94.6 (152.3) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall-Balcony	92.9 (149.8) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-08 Beach Haven – Day	77.1 (124.1) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-08 Beach Haven – Night	77.1 (124.1) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-10 Barnegat Lighthouse (Elevated 170 feet)	66.4 (106.9) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-13 Mantoloking	61.5 (99.5) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-18 Allenhurst Historic District	61.4 (98.8) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-26 Fort Tilden (Night)	66.6 (107.2) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-28 Jones Beach	54.4 (87.5) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-30 Shinnecock Inlet	55.2 (88.8) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-31-Daytime Westhampton Beach	49.4 (29.4) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-32 Fire Island Lighthouse-Upper Deck (Elevated 167 feet)	45.7 (73.5) R, AL, N R	16.5° (13%)	Medium Weak	Medium Weak	Medium Weak	Medium Weak	Medium Small	4 1	Moderate -------	------- Negligible	Same as Alternative B
PREDICTED VISIBILITY KOP-32 Fire Island Lighthouse-Upper Deck (Elevated 167 feet)	45.7 (73.5) R, AL, N R	16.5° (13%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-35 Navesink Twin Lights Lighthouse (Elevated 255 feet)	65.0 (104.6) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-36 Asbury Park Hall-Balcony (Elevated 46.14 feet)	61.3 (98.7) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-37 Point O' Woods	44.8 (72.1) R	17° (14%)	Weak None	Weak None	Weak None	Weak None	Small None	1 0	Minor -------	------- Negligible	Same as Alternative B
PREDICTED VISIBILITY KOP-37 Point O' Woods	44.8 (72.1) R	17° (14%)	Weak	Weak	Weak	Weak	Small	0	Negligible	Negligible	Same as Alternative B
KOP-39 Empire State Building Observation Deck (Elevated 1,263.1 feet)	78.2 (125.8) R	9.1° (7%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-40 Robert Moses Field-Nighttime	45.9 (73.9) R	16.4° (13%)	Weak	Weak	Negligible	Negligible	Small	0	Negligible	Negligible	Negligible (ADLS)
KOP-A	20–47.4 (0–76.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Major	Same as Alternative B
KOP-B	20–47.4 (0–76.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Major	Same as Alternative B

[1] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, M = mid-tower light, O = OSS, and Y = yellow tower base color.
[2] WTGs and OSS visibility: 0-Not visible. 1 – Visible only after extended study; otherwise not visible. 2 – Visible when viewing in general direction of the lease areas; otherwise, likely to be missed by casual observer. 3 – Visible after brief glance in general direction of the lease areas; unlikely to be missed by casual observer. 4 – Plainly visible; could not be missed by casual observer but does not strongly attract visual attention or dominate view. 5 – Strongly attracts viewers' attention to the lease areas; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 – Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (Sullivan et al. 2013).

Table H-37. 1,312-foot and 853-foot WTG NY Bight projects magnitude and impacts for OSC-A 0538

KOP	Distance in Miles (Kilometers) and Noticeable Elements[1]	Visible FOV Degrees (% of 124°)	OCS-A 0538 Contrast, Scale of Change, and Prominence						OCS-A 0538 Impact Level		
	OCS-A 0538		Form	Line	Color	Texture	Scale	Prominence[2]	1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-02 Lucy the Margate Elephant	69.5 (111.8) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-04 John Stafford Beach Entrance	66.7 (107.3) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall – Balcony	65.0 (104.6) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-08 Beach Haven – Day	50.5 (81.2) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-08 Beach Haven – Night	50.5 (81.2) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-10 Barnegat Lighthouse (Elevated 170 feet)	42.7 (68.7) R, AL, N, H R	15.4° (12%)	Moderate Minor	Minor Minor	Moderate Minor	Minor Minor	Small Small	2 1	Minor -------	------- Minor	Same as Alternative B
PREDICTED VISIBILITY KOP-10 Barnegat Lighthouse (Elevated 170 feet)	42.7 (68.7) R, AL, N, H R	15.4° (12%)	Minor None	Minor None	Minor None	Minor None	Small Small	1 0	Negligible -------	------- Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-13 Mantoloking	44.1 (70.9) R	11.2° (9%)	Weak None	Weak None	Weak None	Weak None	Small None	1 0	Minor -------	------- Negligible	Same as Alternative B
PREDICTED VISIBILITY KOP-13 Mantoloking	44.1 (70.9) R	11.2° (9%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-18 Allenhurst Historic District	48.1 (77.5) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-26 Fort Tilden (Night)	60.6 (97.5) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-28 Jones Beach	55.0 (87.9) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-30 Shinnecock Inlet	79.9 (128.5) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-31 Westhampton Beach	69.8 (112.3) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-32 Fire Island Lighthouse Deck (Elevated 167 feet)	55.6 (89.5) R	13.5° (11%)	Weak None	Weak None	Weak None	Weak None	Small None	1 0	Minor -------	------- Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-35 Twin Lights Lighthouse (Elevated 255 feet)	55.0 (88.6) R	9° (7%)	Weak None	Weak None	Weak None	Weak None	Small None	1 0	Negligible -------	------- Negligible	Same as Alternative B
PREDICTED VISIBILITY KOP-35 Twin Lights Lighthouse (Elevated 255 feet)	55.0 (88.6) R	9° (7%)	None	None	None	None	None	0 0	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-36 Asbury Park Hall (Elevated 46.14 feet)	47.5 (76.50) R	10.2° (8%)	Weak None	Weak None	Weak None	Weak None	Small None	1 0	Minor -------	------- Negligible	Same as Alternative B
PREDICTED VISIBILITY KOP-36 Asbury Park Hall (Elevated 46.14 feet)	47.5 (76.50) R	10.2° (8%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-37 Point O' Woods	57.1 (91.9) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-39 Empire State Building (Elevated 1,263.1 feet)	73.8 (118.9) R, AL, N, H R	7.8° (6%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-40 Robert Moses Field 5 – Night	55.5 (89.2) None	None	None	None	None	None	None	0	Negligible	Negligible	Negligible (ADLS)
KOP-A	11–47.4 (0–76.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Major	Same as Alternative B

KOP	Distance in Miles (Kilometers) and Noticeable Elements[1]	Visible FOV Degrees (% of 124°)	OCS-A 0538 Contrast, Scale of Change, and Prominence						OCS-A 0538 Impact Level		
	OCS-A 0538		Form	Line	Color	Texture	Scale	Prominence[2]	1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-B	11–47.4 (0–76.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Major	Same as Alternative B

[1] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, M = mid-tower light, O = OSS, and Y = yellow tower base color.

[2] WTGs and OSS visibility: 0 – Not visible. 1 – Visible only after extended study; otherwise not visible. 2 – Visible when viewing in general direction of the lease areas; otherwise, likely to be missed by casual observer. 3 – Visible after brief glance in general direction of the lease areas; unlikely to be missed by casual observer. 4 – Plainly visible; could not be missed by casual observer but does not strongly attract visual attention or dominate view. 5 – Strongly attracts viewers' attention to the lease areas; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 –Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (Sullivan et al. 2013).

Table H-38. 1,312-foot and 853-foot WTG NY Bight projects magnitude and impacts for OSC-A 0539

KOP	Distance in Miles (Kilometers) and Noticeable Elements[1]	Visible FOV Degrees (% of 124°)	OCS -A 0539 Contrast, Scale of Change, and Prominence						Impact Level		
	OCS-A 0539		Form	Line	Color	Texture	Scale	Prominence[2]	1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-02 Lucy the Margate Elephant	59.4 (95.6) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-04 John Stafford Beach Entrance	53.2 (85.7) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall – Balcony	51.6 (83.1) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-08 Beach Haven – Day	40.4 (64.9) R	18.1° (17%)	Weak	Weak	Weak	Weak	Small	1	Negligible	Negligible	Same as Alternative B
KOP-08 Beach Haven – Night	40.4 (64.9) R	18.1° (17%)	None	None	None	None	None	2	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-10 Barnegat Lighthouse (Elevated 170 feet)	37.7 (60.7) R, AL, N, H, M R, AL, N, H	20.6° (17%)	Moderate Weak	Moderate Weak	Strong Moderate	Moderate Weak	Medium Small	4 2	Moderate -------	------- Minor	Same as Alternative B
PREDICTED VISIBILITY KOP-10 Barnegat Lighthouse (Elevated 170 feet)	37.7 (60.7) R, AL, N, H, M	20.6° (17%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-13 Mantoloking	41.7 (72.4) R	19.7° (16%)	Weak None	Weak None	Weak None	Weak None	Small None	1	Minor -------	------- Negligible	Same as Alternative B
KOP-18 Allenhurst Historic District	53.2 (85.6) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-26 Fort Tilden (Night)	69.1 (111.2) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-28 Jones Beach	64.7 (104.1) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-30 Shinnecock Inlet	91.7 (147.5) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-31 Westhampton Beach	82.0 (131.9) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-32 Fire Island Lighthouse Deck (Elevated 167 feet)	67.0 (107.9) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-35 Twin Lights Lighthouse (Elevated 255 feet)	62.2 (100.1) R	16.8° (14%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-36 Asbury Park Hall (Elevated 46.14 feet)	52.1 (83.9) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-37 Point O' Woods	68.7 (110.6) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-39 Empire State Building (Elevated 1,263.1 feet)	82.9 (133.4) R	13.2° (11%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-40 Robert Moses Field 5 – Night	66.7 (107.3) None	None	None	None	None	None	None	0	Negligible	Negligible	Negligible (ADLS)
KOP-A	14–47.4 (0–76.3) R, AL, N, H, M, O, Y R, AL, N, H, M, O, Y	0–360° (300%)	Strong Strong	Strong Strong	Strong Strong	Strong Strong	Large Large	6 6	Major -------	------- Major	Same as Alternative B
KOP-B	14–47.4 (0–76.3) R, AL, N, H, M, O, Y R, AL, N, H, M, O, Y	0–360° (300%)	Strong Strong	Strong Strong	Strong Strong	Strong Strong	Large Large	6 6	Major -------	------- Major	Same as Alternative B

[1] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, M = mid-tower light, O = OSS, and Y = yellow tower base color.

[2] WTGs and OSS visibility: 0 – Not visible. 1 – Visible only after extended study; otherwise not visible. 2 – Visible when viewing in general direction of the lease areas; otherwise, likely to be missed by casual observer. 3 – Visible after brief glance in general direction of the lease areas; unlikely to be missed by casual observer. 4 – Plainly visible; could not be missed by casual observer but does not strongly attract visual attention or dominate view. 5 – Strongly attracts viewers' attention to the lease areas; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 – Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (Sullivan et al. 2013).

Table H-39. 1,312-foot and 853-foot WTG NY Bight projects magnitude and impacts for OSC-A 0541

KOP	Distance in Miles (Kilometers) and Noticeable Elements[1]	Visible FOV Degrees (% of 124°)	OCS -A 0541 Contrast, Scale of Change, and Prominence						OCS-A 0541 Impact Level		
	OCS-A 0541		Form	Line	Color	Texture	Scale	Prominence[2]	1,312-Foot WTGs	853-Foot WTGs	Alternative C
MAXIMUM VISIBILITY KOP-02 Lucy the Margate Elephant	46.4 (74.7) R	23.1° (19%)	Weak None	Weak None	Weak None	Weak None	Small None	1 0	Negligible -------	------- Negligible	Same as Alternative B
PREDICTED VISIBILITY KOP-02 Lucy the Margate Elephant	46.4 (74.7) R	23.1° (19%)	None	None	None	None	None	0	Negligible -	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-04 John Stafford Beach Entrance	43.7 (70.5) R	24.4° (20%)	Weak None	Weak None	Weak None	Weak None	Small None	1 0	Negligible -------	------- Negligible	Same as Alternative B
PREDICTED VISIBILITY KOP-04 John Stafford Beach Entrance	43.7 (70.5) R	24.4° (20%)	None	None	None	None	None	0	Negligible -	Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall – Balcony	42.3 (68.0) R	25.2° (20%)	None	None	None	None	None	0 0	Negligible -------	------- Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-08 Beach Haven – Day	32.9 (53.0) R, AL, N, H	28.1° (23%)	Moderate Weak	Moderate Weak	Moderate Weak	Moderate Weak	Small Small	3 1	Moderate -------	------- Minor	Same as Alternative B
PREDICTED VISIBILITY KOP-08 Beach Haven – Day	32.9 (53.0) R, AL, N, H	28.1° (23%)	None	None	None	None	None	0	Negligible -	Negligible	Same as Alternative B
KOP-08 Beach Haven – Night	32.9 (53.0) R, AL, N, H	28.1° (23%)	Moderate Moderate	Moderate Weak	Moderate Moderate	Moderate Weak	Small Small	4 4	Moderate -------	------- Moderate	Negligible (ADLS)
MAXIMUM VISIBILITY KOP-10 Barnegat Lighthouse (Elevated 170 feet)	32.2 (52.0) R, AL, N, H, M, O R, AL, N, H, M, O	23.8° (19%)	Moderate Weak	Moderate Weak	Moderate Moderate	Moderate Moderate	Small Small	3 2	Minor -------	------- Minor	Same as Alternative B
PREDICTED VISIBILITY KOP-10 Barnegat Lighthouse (Elevated 170 feet)	32.2 (52.0) R, AL, N, H, M, O R, AL, N, H, M, O	23.8° (19%)	Weak None	Weak None	Weak None	Weak None	Small None	3 0	Minor -----	-------- Negligible	Same as Alternative B
KOP-13 Mantoloking	44.6 (71.7) R	16.4° (13%)	Weak None	Weak None	Weak None	Weak None	Small None	1 0	Negligible -------	------- Negligible	Same as Alternative B
KOP-18 Allenhurst Historic District	55.7 (89.7) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-26 Fort Tilden (Night)	76.0 (122.2) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-28 Jones Beach	75.5 (121.9) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-30 Shinnecock Inlet	110.3 (177.4) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-31 Westhampton Beach	99.6 (160.3) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-32 Fire Island Lighthouse Deck (Elevated 167 feet)	81.9 (131.9) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-35 Twin Lights Lighthouse (Elevated 255 feet)	66.0 (106.2) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-36 Asbury Park Hall (Elevated 46.14 feet)	54.4 (87.5) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-37 Point O' Woods	84.4 (135.9) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-39 Empire State Building (Elevated 1,263.1 feet)	89.0 (143.2) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-40 Robert Moses Field 5 – Night	81.5 (131.1) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-A	5–47.4 (0–76.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Major	Same as Alternative B

KOP	Distance in Miles (Kilometers) and Noticeable Elements[1] OCS-A 0541	Visible FOV Degrees (% of 124°)	OCS -A 0541 Contrast, Scale of Change, and Prominence: Form	Line	Color	Texture	Scale	Prominence[2]	OCS-A 0541 Impact Level: 1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-B	5–47.4 (0–76.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Major	Same as Alternative B

[1] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, M = mid-tower light, O = OSS, and Y = yellow tower base color.

[2] WTGs and OSS visibility: 0 – Not visible. 1 – Visible only after extended study; otherwise not visible. 2 – Visible when viewing in general direction of the lease areas; otherwise, likely to be missed by casual observer. 3 – Visible after brief glance in general direction of the lease areas; unlikely to be missed by casual observer. 4 – Plainly visible; could not be missed by casual observer but does not strongly attract visual attention or dominate view. 5 – Strongly attracts viewers' attention to the lease areas; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 – Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (Sullivan et al. 2013).

Table H-40. 1,312-foot and 853-foot WTG NY Bight projects magnitude and impacts for OSC-A 0542

	Distance in Miles (Kilometers) and Noticeable Elements[1]		OCS -A 0542 Contrast, Scale of Change, and Prominence						Impact Level		
KOP	OCS-A 0542	Visible FOV Degrees (% of 124°)	Form	Line	Color	Texture	Scale	Prominence[2]	1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-02 Lucy the Margate Elephant	48.9 (78.7) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-04 John Stafford Beach Entrance	46.8 (75.4) R	18.2° (15%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall - Balcony	45.5 (73.3) R	18.9° (15%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-08 Beach Haven – Day	42.3 (68.2) R, AL, N, H	24.3° (20%)	Moderate Weak	Moderate Weak	Moderate Weak	Moderate Weak	Small Small	3 1	Moderate -------	------- Minor	Same as Alternative B
PREDICTED VISIBILITY KOP-08 Beach Haven – Day	42.3 (68.2) R	24.3° (20%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-08 Beach Haven – Night	42.3 (68.2) R	24.3° (20%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-10 Barnegat Lighthouse (Elevated 170 feet)	42.5 (68.4) R, AL, N, H R, AL, N, H	18.2° (15%)	Moderate Weak	Moderate Weak	Moderate Moderate	Moderate Moderate	Small Small	3 2	Minor -------	------- Minor	Same as Alternative B
PREDICTED VISIBILITY KOP-10 Barnegat Lighthouse (Elevated 170 feet)	42.5 (68.4) R, AL, N, H R, AL, N, H	18.2° (15%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-13 Mantoloking	53.2 (85.7) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-18 Allenhurst Historic District	63.3 (101.8) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-26 Fort Tilden (Night)	82.0 (131.9) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-28 Jones Beach	80.9 (130.1) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-30 Shinnecock Inlet	109.7 (176.6) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative C
KOP-31 Westhampton Beach	99.6 (160.3) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-32 Fire Island Lighthouse Deck (Elevated 167 feet)	83.9 (135.0) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-35 Twin Lights Lighthouse (Elevated 255 feet)	73.2 (117.8) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-36 Asbury Park Hall (Elevated 46.14 feet)	62.0 (99.8) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-37 Point O' Woods	85.8 (138.1) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-39 Empire State Building (Elevated 1,263.1 feet)	95.3 (153.4) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-40 Robert Moses Field 5 – Night	83.5 (134.3) None	None	None	None	None	None	None	0	Negligible	Negligible	Negligible (ADLS)
KOP-A	14–47.4 (0 – 76.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Major	Same as Alternative B

KOP	Distance in Miles (Kilometers) and Noticeable Elements[1]	Visible FOV Degrees (% of 124°)	OCS -A 0542 Contrast, Scale of Change, and Prominence						Impact Level		
	OCS-A 0542		Form	Line	Color	Texture	Scale	Prominence[2]	1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-B	14–47.4 (0 – 76.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Major	Same as Alternative B

[1] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, M = mid-tower light, O = OSS, and Y = yellow tower base color.

[2] WTGs and OSS visibility: 0 – Not visible. 1 – Visible only after extended study; otherwise not visible. 2 – Visible when viewing in general direction of the lease areas; otherwise, likely to be missed by casual observer. 3 – Visible after brief glance in general direction of the lease areas; unlikely to be missed by casual observer. 4 – Plainly visible; could not be missed by casual observer but does not strongly attract visual attention or dominate view. 5 – Strongly attracts viewers' attention to the lease areas; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 – Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (Sullivan et al. 2013).

Table H-41. 1,312-foot and 853-foot WTG NY Bight projects magnitude and impacts for OSC-A 0544

KOP	Distance in Miles (Kilometers) and Noticeable Elements[1]	Visible FOV Degrees (% of 124°)	OCS -A 0544 Contrast, Scale of Change, and Prominence						OCS-A 0544 Impact Level		
	OCS-A 0544		Form	Line	Color	Texture	Scale	Prominence[2]	1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-02 Lucy the Margate Elephant	92.7 (149.1) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-04 John Stafford Beach Entrance	89.7 (144.6) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall – Balcony	88.2 (141.9) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-08 Beach Haven – Day	70.8 (113.9) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-08 Beach Haven – Night	70.8 (113.9) None	None	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-10 Barnegat Lighthouse (Elevated 170 feet)	57.0 (91.8) R	5.8° (5%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-13 Mantoloking	47.3 (61.4) R	8.9° (7%)	None None	None None	Weak None	None None	Small None	1 0	Negligible ------	------ Negligible	Same as Alternative B
PREDICTED VISIBILITY KOP-13 Mantoloking	47.3 (61.4) R	8.9° (7%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-18 Allenhurst Historic District	42.5 (68.4) R	12.2° (10%)	Weak None	Weak None	Weak None	Weak None	Small None	1 0	Minor -------	------- Negligible	Same as Alternative B
PREDICTED VISIBILITY KOP-18 Allenhurst Historic District	42.5 (68.4) R	12.2° (10%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-26 Fort Tilden (Night)	43.9 (70.6) R	16.1° (13%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-28 Jones Beach	31.9 (51.4) R, AL, N, H R	23.1° (19%)	Weak Weak	Weak Weak	Medium Weak	Weak Weak	Small Small	3 1	Minor ------	------ Minor	Same as Alternative B
PREDICTED VISIBILITY KOP-28 Jones Beach	31.9 (51.4) R, AL, N, H R	23.1° (19%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-30 Shinnecock Inlet	44.5 (71.9) R	7.4° (6%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
PREDICTED VISIBILITY KOP-30 Shinnecock Inlet	44.5 (71.9) R	7.4° (6%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-31 Westhampton Beach	33.9 (54.5) R, AL, N, H R	11.5° (9%)	Weak Weak	Weak Weak	Weak Weak	Weak Weak	Small Small	2 1	Minor ------	------- Negligible	Same as Alternative B
PREDICTED VISIBILITY KOP-31 Westhampton Beach	33.9 (54.5) R, AL, N, H R	11.5° (9%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-32 Fire Island Lighthouse Deck (Elevated 167 feet)	24.2 (38.9) R, AL, N, H, M, Y R, AL, N, H, M, Y	27.9° (22%)	Moderate Moderate	Moderate Moderate	Strong Strong	Moderate Moderate	Medium Medium	4 4	Moderate -------	------ Moderate	Same as Alternative B
PREDICTED VISIBILITY KOP-32 Fire Island Lighthouse Deck (Elevated 167 feet)	24.2 (38.9) R, AL, N, H, M, Y R, AL, N, H, M,	27.9° (22%)	Weak Weak	Weak Weak	Weak Weak	Moderate Weak	Medium Small	3 2	Minor -------	-------- Minor	Same as Alternative B
MAXIMUM VISIBILITY KOP-35 Twin Lights Lighthouse (Elevated 255 feet)	44.0 (70.9) R, AL, N, H, M R, AL, N, H, M	13.9° (11%)	Weak Weak	Weak Weak	Weak Weak	Weak Weak	Small Small	1 1	Minor ------	------ Minor	Same as Alternative B
PREDICTED VISIBILITY KOP-35 Twin Lights Lighthouse (Elevated 255 feet)	44.0 (70.9) R, AL, N, H, M R, AL, N, H, M	13.9° (11%)	None None	None None	None None	None None	None None	0 0	Negligible -------	------- Negligible	Same as Alternative B

KOP	Distance in Miles (Kilometers) and Noticeable Elements[1] OCS-A 0544	Visible FOV Degrees (% of 124°)	OCS -A 0544 Contrast, Scale of Change, and Prominence: Form	Line	Color	Texture	Scale	Prominence[2]	OCS-A 0544 Impact Level: 1,312-Foot WTGs	853-Foot WTGs	Alternative C
MAXIMUM VISIBILITY KOP-36 Asbury Park Hall (Elevated 46.14 feet)	42.9 (69.0) R	12.0° (10%)	Weak None	Weak None	Weak None	Weak None	Small None	1 0	Negligible --------	------- Negligible	Same as Alternative B
PREDICTED VISIBILITY KOP-36 Asbury Park Hall (Elevated 46.14 feet)	42.9 (69.0) R	12.0° (10%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
MAXIMUM VISIBILITY KOP-37 Point O' Woods (Alternative B Impact Level based on KOP-40 nighttime impact)	24.1 (38.7) R, AL, N, H, M, O R, AL, N, H, M, O	25.7° (21%)	Moderate Moderate	Strong Moderate	Strong Strong	Moderate Moderate	Medium Medium	4 3	Moderate ------	------- Moderate	Moderate (ADLS) Minor (ADLS)
PREDICTED VISIBILITY KOP-37 Point O' Woods	24.1 (38.7) R, AL, N, H, M, O R, AL, N, H, M, O	25.7° (21%)	Moderate Weak	Moderate Weak	Moderate Weak	Moderate Weak	Medium Small	3 2	Moderate -------	-------- Minor	Same as Alternative B
MAXIMUM VISIBILITY KOP-39 Empire State Building (Elevated 1,263.1 feet)	55.35 (89.0) R, AL, N, H, M, O, Y R, AL, N, H, M, O	13.4° (11%)	Weak Weak	Weak Weak	Moderate Weak	Moderate Weak	Small Small	2 1	Minor ------	------ Minor	Same as Alternative B
PREDICTED VISIBILITY KOP-39 Empire State Building (Elevated 1,263.1 feet)	55.35 (89.0) R, AL, N, H, M, O, Y R, AL, N, H, M, O	13.4° (11%)	None	None	None	None	None	0	Negligible	Negligible	Same as Alternative B
KOP-40 Robert Moses Field 5 – Night	24.2 (38.9) R, AL, N, H, M, O	28.3° (23%)	Weak Weak	Strong Strong	Strong Strong	Weak Weak	Large Large	6 6	Major -----	----- Major	Negligible (ADLS)
KOP-A	0–47.4 (0–76.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Major	Same as Alternative B
KOP-B	0–47.4 (0–76.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Major	Same as Alternative B

[1] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, M = mid-tower light, O = OSS, and Y = yellow tower base color.

[2] WTGs and OSS visibility: 0 – Not visible. 1 – Visible only after extended study; otherwise not visible. 2 – Visible when viewing in general direction of the lease areas; otherwise, likely to be missed by casual observer. 3 – Visible after brief glance in general direction of the lease areas; unlikely to be missed by casual observer. 4 – Plainly visible; could not be missed by casual observer but does not strongly attract visual attention or dominate view. 5 – Strongly attracts viewers' attention to the lease areas; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 – Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (Sullivan et al. 2013).

Table H-42. 1,312-foot NY Bight projects magnitude and impacts (six projects)

KOP	Distance in Miles (Kilometers) and Noticeable Elements[1] OCS-A 0537	OCS-A 0538	OCS-A 0539	OCS-A 0541	OCS-A 0542	OCS-A 0544	New York Bight Visible FOV Degrees (% of 124°)	New York Bight Contrast, Scale of Change, and Prominence Form	Line	Color	Texture	Scale	Prominence[2]	Impact Level	Alternative C
KOP-02 Lucy the Elephant	97.4 (156.8) None	69.5 (111.8) None	59.4 (95.6) None	46.4 (74.7) R	48.9 (78.7) None	92.7 (149.1) None	24° (19%)	Weak	Weak	Weak	Weak	Small	1	Negligible	Same as Alternative B
KOP-04 John Stafford Hall Beach Entrance	94.6 (152.3) None	66.7 (107.3) None	53.2 (85.7) None	43.7 (70.5) R	46.8 (75.4) R	89.7 (144.6) None	27° (22%)	Weak	Weak	Weak	Weak	Small	1	Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall Balcony	92.9 (149.8) None	65.0 (104.6) None	51.6 (83.1) None	42.3 (68.0) R	45.5 (73.3) R	88.2 (141.9) None	28° (23%)	Weak	Weak	Weak	Weak	Small	1	Negligible	Same as Alternative B
KOP-08A/B Beach Haven – Daytime and Nighttime	77.1 (124.1) None	50.5 (81.2) None	40.4 (64.9) R	32.9 (53.0) R, AL, N, H	42.3 (68.2) R	70.8 (113.9) None	42° (34%)	Moderate	Moderate	Moderate	Moderate	Medium	4	Moderate	Same as Alternative B
KOP-10 Barnegat Lighthouse (Elevated 170 feet)	66.4 (106.9) None	42.7 (68.7) R, AL, N, H,	37.7 (60.7) R, AL, N, H, M,	32.2 (52.0) R, AL, N, H, M, O	42.5 (68.4) R, AL, N, H,	57.0 (91.8) R	84° (68%)	Moderate	Moderate	Strong	Moderate	Medium	4	Moderate	Same as Alternative B
KOP-13 Mantoloking	61.5 (99.5) None	44.1 (70.9) R	41.7 (72.4) R	44.6 (71.7) R	53.2 (85.7) None	47.3 (61.4) R	81° (65%)	Weak	Weak	Weak	Weak	Small	2	Minor	Same as Alternative B
KOP-18 Allenhurst Residential HD	61.4 (98.8) None	48.1 (77.5) None	53.2 (85.6) None	55.7 (89.7) None	63.3 (101.8) None	42.5 (68.4) R	12° (10%)	Weak	Weak	Weak	Weak	Small	2	Minor	Same as Alternative B
KOP-26 Fort Tilden - nighttime	66.6 (107.2) None	60.6 (97.5) None	69.1 (111.2) None	76.0 (122.2) None	82.0 (131.9) None	43.9 (70.6) R	16° (13%)	None	None	None	None	None	0	Negligible	Same as Alternative B
KOP-28 Jones Beach	54.4 (87.5) None	55.0 (87.9) None	64.7 (104.1) None	75.5 (121.9) None	80.9 (130.1) None	31.9 (51.4) R, AL, N, H	22° (18%)	Weak	Weak	Moderate	Moderate	Small	3	Minor	Same as Alternative B
KOP-30 Shinnecock Inlet	55.2 (88.8) None	79.9 (128.5) None	91.7 (147.5) None	110.3 (177.4) None	109.7 (176.6) None	44.5 (71.9) R	6° (5%)	None	None	None	None	None	0	Negligible	Same as Alternative B
KOP-31 Westhampton Beach – Daytime	49.4 (29.4) None	69.8 (112.3) None	82.0 (131.9) None	99.6 (160.3) None	99.6 (160.3) None	33.9 (54.5) R, AL, N, H	13° (10%)	Weak	Weak	Weak	Weak	Small	2	Minor	Same as Alternative B
KOP-32 Fire Island LH Upper Deck (Elevated 167 feet)	45.7 (73.5) R, AL, N	55.6 (89.5) R	67.0 107.9) None	81.9 (131.9) None	83.9 (135.0) None	24.2 (38.9) R, AL, N, H, M, Y	33° (27%)	Moderate	Moderate	Strong	Moderate	Medium	4	Moderate	Same as Alternative B
KOP-35 Twin Lights LH (Elevated 255 feet)	65.0 (104.6) None	55.0 (88.6) R	62.2 (100.1) None	66.0 (106.2) None	73.2 (117.8) None	44.0 (70.9) R, AL, N, H, M	15° (12%)	Weak	Weak	Weak	Weak	Small	1	Minor	Same as Alternative B
KOP-36 Ashbury Park Hall – Top (Elevated 46.14 feet)	61.3 (98.7) None	47.5 (76.50) R	52.1 (83.9) R	54.4 (87.5) None	62.0 (99.8) None	42.9 (69.0) R	23° (18%)	Weak	Weak	Weak	Weak	Small	1	Negligible	Same as Alternative B
KOP-37 Point O' Woods (Alternative B Impact Level based on KOP-40 nighttime impact)	44.8 (72.1) R	57.1 (91.9) None	68.7 (110.6) None	84.4 (135.9) None	85.8 (138.1) None	24.1 (38.7) R, AL, N, H, M, O	38° (31%)	Moderate	Strong	Strong	Moderate	Medium	4	Moderate (Major Nighttime)	Same as Alternative B (Negligible with ADLS)
KOP-39 Empire State Building (Elevated 1,263.1 feet)	78.2 (125.8) R	73.8 (118.9) R, AL, N, H	82.9 (133.4) R	89.0 (143.2) None	95.3 (153.4) None	55.35 (89.0) R, AL, N, H, M, O, Y	36° (29%)	Weak	Weak	Weak	Weak	Small	2	Minor	Same as Alternative B
KOP-40 Robert Moses Field – Nighttime	45.9 73.9) R	55.5 (89.2) None	66.7 (107.3) None	81.5 (131.1) None	83.5 (134.3) None	24.2 (38.9) R, AL, N, H, M, O	33° (27%)	Weak	Strong	Strong	Weak	Medium	5	Major	Negligible (ADLS)
KOP-A Recreational Fishing, Pleasure, and Tour Boat Area	0–47.4 (76.3) R, AL, N, H, M, O, Y	0–47.4 (76.3) (68.4) R, AL, N, H, M, O, Y	0–47.4 (76.3) R, AL, N, H, M, O, Y	0–47.4 (76.3) (68.4) R, AL, N, H, M, O, Y	0–47.4 (76.3) R, AL, N, H, M, O, Y	0–47.4 (76.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Same as Alternative B

KOP	Distance in Miles (Kilometers) and Noticeable Elements[1]						New York Bight Visible FOV Degrees (% of 124°)	New York Bight Contrast, Scale of Change, and Prominence							
	OCS-A 0537	OCS-A 0538	OCS-A 0539	OCS-A 0541	OCS-A 0542	OCS-A 0544		Form	Line	Color	Texture	Scale	Prominence[2]	Impact Level	Alternative C
KOP-B Commercial and Cruise Ship Shipping Lanes	0–47.4 (76.3) R, AL, N, H, M, O, Y	0–47.4 (76.3) (68.4) R, AL, N, H, M, O, Y	0–47.4 (76.3) R, AL, N, H, M, O, Y	0–47.4 (76.3) (68.4) R, AL, N, H, M, O, Y	0–47.4 (76.3) R, AL, N, H, M, O, Y	0–47.4 (76.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Same as Alternative B

[1] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, M = mid-tower light, O = OSS, and Y = yellow tower base color.

[2] WTGs and OSS visibility: 0 – Not visible. 1 – Visible only after extended study; otherwise not visible. 2 – Visible when viewing in general direction of the lease areas; otherwise, likely to be missed by casual observer. 3 – Visible after brief glance in general direction of the lease areas; unlikely to be missed by casual observer. 4 – Plainly visible; could not be missed by casual observer but does not strongly attract visual attention or dominate view. 5 – Strongly attracts viewers' attention to the lease areas; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 – Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (Sullivan et al. 2013).

LH = Lighthouse; HD = Historic District

Table H-43. 853-foot NY Bight projects magnitude and impacts (six projects)

KOP[1]	Distance in Miles (Kilometers) and Noticeable Elements[2]						New York Bight Visible FOV Degrees (% of 124°)	New York Bight Contrast, Scale of Change, and Prominence							
	OCS-A 0537	OCS-A 0538	OCS-A 0539	OCS-A 0541	OCS-A 0542	OCS-A 0544		Form	Line	Color	Texture	Scale	Prominence[3]	Impact Level	Alternative C
KOP-02 Lucy the Elephant	97.4 (156.8) None	69.5 (111.8) None	59.4 (95.6) None	46.4 (74.7) None	48.9 (78.7) None	92.7 (149.1) None	None	None	None	None	None	None	0	Negligible	Same as Alternative B
KOP-04 John Stafford Hall-Beach Entrance	94.6 (152.3) None	66.7 (107.3) None	53.2 (85.7) None	43.7 (70.5) None	46.8 (75.4) None	89.7 (144.6) None	None	None	None	None	None	None	0	Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall-Balcony	92.9 (149.8) None	65.0 (104.6) None	51.6 (83.1) None	42.3 (68.0) None	45.5 (73.3) None	88.2 (141.9) None	None	None	None	None	None	None	0	Negligible	Same as Alternative B
KOP-08A/B Beach Haven – Daytime and Nighttime	77.1 (124.1) None	50.5 (81.2) None	40.4 (64.9) None	32.9 (53.0) R	42.3 (68.2) None	70.8 (113.9) None	23.9°	Weak	Weak	Weak	Weak	Small	2	Minor	Same as Alternative B
KOP-10 Barnegat LH (Elevated 170 feet)	66.4 (106.9) None	42.7 (68.7) R	37.7 (60.7) R, AL, N, H, M	32.2 (52.0) R, AL, N, H, M, O,	42.5 (68.4) R, AL, N, H	57.0 (91.8) R	89.8° (72%)	Weak	Weak	Moderate	Weak	Small	2	Minor	Same as Alternative B
KOP-13 Mantoloking	61.5 (99.5) None	44.1 (70.9) None	41.7 (72.4) None	44.6 (71.7) None	53.2 (85.7) None	47.3 (61.4) None	None	None	None	None	None	None	0	Negligible	Same as Alternative B
KOP-18 Allenhurst Residential HD	61.4 (98.8) None	48.1 (77.5) None	53.2 (85.6) None	55.7 (89.7) None	63.3 (101.8) None	42.5 (68.4) R	12.2° (10%)	Weak	Weak	Weak	Weak	Small	2	Minor	Same as Alternative B
KOP-26 Fort Tilden	66.6 (107.2) None	60.6 (97.5) None	69.1 (111.2) None	76.0 (122.2) None	82.0 (131.9) None	43.9 (70.6) None	None	None	None	None	None	None	0	Negligible	Same as Alternative B
KOP-28 Jones Beach	54.4 (87.5) None	55.0 (87.9) None	64.7 (104.1) None	75.5 (121.9) None	80.9 (130.1) None	31.9 (51.4) R	23.1° (19%)	Weak	Weak	Weak	Weak	Small	2	Minor	Same as Alternative B
KOP-30 Shinnecock Inlet	55.2 (88.8) None	79.9 (128.5) None	91.7 (147.5) None	110.3 (177.4) None	109.7 (176.6) None	44.5 (71.9) None	None	None	None	None	None	None	0	Negligible	Same as Alternative B
KOP-31- Westhampton Beach Daytime	49.4 (29.4) None	69.8 (112.3) None	82.0 (131.9) None	99.6 (160.3) None	99.6 (160.3) None	33.9 (54.5) R	11.5° (9%)	Weak	Weak	Weak	Weak	Small	2	Minor	Same as Alternative B
KOP-32 Fire Island LH-Upper Deck (Elevated 167 feet)	45.8 (73.7) R	55.8 (89.7) R	67.0 107.9) None	81.9 (131.9) None	83.9 (135.0) None	24.2 (38.9) R, AL, N, H, M	48.2° (39%)	Moderate	Moderate	Moderate	Moderate	Medium	5	Moderate	Same as Alternative B
KOP-35 Twin Lights LH (Elevated 255 feet)	65.0 (104.6) None	55.0 (88.6) R	62.2 (100.1) None	66.0 (106.2) None	73.2 (117.8) None	44.0 (70.9) R, AL, N, H, M	22.9° (18%)	None	None	None	None	None	0	Negligible	Same as Alternative B
KOP-36 Asbury Park Hall-Top (Elevated 46 feet)	61.3 (98.7) None	47.5 (76.50) None	52.1 (83.9) None	54.4 (87.5) None	62.0 (99.8) None	42.9 (69.0) None	12.0° (10%)	None	None	None	None	None	0	Negligible	Same as Alternative B
KOP-37 Point O' Woods (Alternative B Impact Level based on KOP-40 nighttime impact)	44.8 (72.1) None	57.1 (91.9) None	68.7 (110.6) None	84.4 (135.9) None	85.8 (138.1) None	24.1 (38.7) R, AL, N, H, M, O	25.7° (21%)	Moderate	Moderate	Strong	Strong	Medium	4	Moderate	Minor
KOP-39 Empire State Building (Elevated 1,263 feet)	78.2 (125.8) R	73.8 (118.9) R	82.9 (133.4) None	89.0 (143.2) None	95.3 (153.4) None	55.35 (89.0) R, AL, N, H, M, O	30° (24%)	Weak	Weak	Weak	Weak	Small	1	Negligible	Same as Alternative B
KOP-40 Robert Moses Field 5 – nighttime	45.9 73.9) None	55.5 (89.2) None	66.7 (107.3) None	81.5 (131.1) None	83.5 (134.3) None	24.2 (38.9) R, AL, N, H, M, O	28.3° (23%)	Weak	Strong	Strong	Weak	Medium	5	Major	Negligible (ADLS)

KOP[1]	Distance in Miles (Kilometers) and Noticeable Elements[2]						New York Bight Visible FOV Degrees (% of 124°)	New York Bight Contrast, Scale of Change, and Prominence							
	OCS-A 0537	OCS-A 0538	OCS-A 0539	OCS-A 0541	OCS-A 0542	OCS-A 0544		Form	Line	Color	Texture	Scale	Prominence[3]	Impact Level	Alternative C
KOP-A Recreational Fishing, Pleasure, and Tour Boat Area	0–38.7 (62.3) R, AL, N, H, M, O, Y	0–38.7 (62.3) R, AL, N, H, M, O, Y	0–38.7 (62.3) R, AL, N, H, M, O, Y	0–38.7 (62.3) R, AL, N, H, M, O, Y	0–38.7 (62.3) R, AL, N, H, M, O, Y	0–38.7 (62.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Same as Alternative B
KOP-B Commercial and Cruise Ship Shipping Lanes	0–38.7 (62.3) R, AL, N, H, M, O, Y	0–38.7 (62.3) R, AL, N, H, M, O, Y	0–38.7 (62.3) R, AL, N, H, M, O, Y	0–38.7 (62.3) R, AL, N, H, M, O, Y	0–38.7 (62.3) R, AL, N, H, M, O, Y	0–38.7 (62.3) R, AL, N, H, M, O, Y	0–360° (300%)	Strong	Strong	Strong	Strong	Large	6	Major	Same as Alternative B

[1] LH – Lighthouse, HD – Historic District
[2] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, M = mid-tower light, O = OSS, and Y = yellow tower base color.
[3] WTGs and OSS visibility: 0 – Not visible. 1 – Visible only after extended study; otherwise not visible. 2 – Visible when viewing in general direction of the lease areas; otherwise likely to be missed by casual observer. 3 – Visible after brief glance in general direction of the lease areas; unlikely to be missed by casual observer. 4 – Plainly visible; could not be missed by casual observer, but does not strongly attract visual attention or dominate view. 5 – Strongly attracts viewers' attention to the lease areas; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 – Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (Sullivan et al. 2013).

H.3.2.3 Visual Impact Assessment Summary

The VIA considers the characteristics of the view receptor, characteristics of the view toward the NY Bight project facilities, and the experiential impacts of the NY Bight project. The viewer experiences would be affected by the NY Bight projects' noticeable features; applicable distances and FOV extents; open views versus view framing and intervening foregrounds, and form, line, color, and texture contrasts; scale of change; and prominence in the characteristic seascape and landscape. Higher impact levels would stem from unique, extensive, and long-term appearance of strongly contrasting, large, and prominent vertical structures in the otherwise horizontal seascape environment; where structures are an unexpected element and viewer experience is of formerly open views of high-sensitivity seascape and landscape; and from high sensitivity view receptors. Based on these VIA impact range factors and the geographic analysis area viewer experience analyses, Table H-44 through Table H-50 summarize impacts from the NY Bight projects on the viewer experience (KOP locations) for each lease area and the six NY Bight projects combined. Impacts of the NY Bight projects on viewer experiences range from **negligible** to **major**.

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Table H-44. Summary table for OCS-A 0537 viewer experience

Viewpoint	WTGs	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				OCS-A 0537 Impact Levels		
		Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration									
		High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-02 Lucy the Elephant	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-04 John Stafford Hall Beach Entrance	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall Balcony	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-08A/B Beach Haven – Daytime and Nighttime	1,312	X			X										X					X	Negligible		Negligible (ADLS)
	853	X			X										X					X		Negligible	Negligible (ADLS)
KOP-10 Barnegate LH (Elevated 170 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-13 Mantoloking	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-18 Allenhurst Residential HD	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-26 Fort Tilden – Nighttime	1,312	X			X										X					X	Negligible		Negligible (ADLS)
	853	X			X										X					X		Negligible	Negligible (ADLS)
KOP-28 Jones Beach	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-30 Shinnecock Inlet	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-31-Westhampton Beach – Daytime	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-32 Fire Island LH (Elevated 167 feet)	1,312	X			X				X			X			X			X			Moderate		Same as Alternative B
	853	X			X					X			X		X				X			Minor	Same as Alternative B
KOP-35 Twin Lights LH (Elevated 255 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-36 Ashbury Park Hall – Top (Elevated 46.14 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-37 Point O' Woods	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-39 Empire State Building (Elevated 1,263.1 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-40 Robert Moses Field – Nighttime	1,312	X			X					X			X		X				X		Minor		Negligible (ADLS)
	853	X			X										X					X		Negligible	Negligible (ADLS)
KOP-A Recreational Fishing, Pleasure, and Tour Boat Area [1]	1,312	X			X			X			X				X		X				Major		Same as Alternative B
	853	X			X			X			X				X		X					Major	Same as Alternative B
KOP-B Commercial and Cruise Shipping Lanes [1]	1,312	X			X			X			X				X		X				Major		Same as Alternative B
	853	X			X			X			X				X		X					Major	Same as Alternative B

[1] Representative
LH = Lighthouse; HD = Historic District

Table H-45. Summary table for OCS-A 0538 viewer experience

		Sensitivity						Magnitude of Impact									Visibility Threshold Rating				OCS-A 0538 Impact Levels		
		Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration									
	WTGs	High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-02 Lucy the Elephant	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-04 John Stafford Hall Beach Entrance	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall Balcony	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-08A/B Beach Haven – Daytime and Nighttime	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-10 Barnegate LH (Elevated 170 feet)	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
	853	X			X					X			X		X				X			Minor	Same as Alternative B
KOP-13 Mantoloking	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-18 Allenhurst Residential HD	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-26 Fort Tilden – Nighttime	1,312	X			X										X					X	Negligible		Negligible (ADLS)
	853	X			X										X					X		Negligible	Negligible (ADLS)
KOP-28 Jones Beach	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-30 Shinnecock Inlet	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-31-Westhampton Beach – Daytime	1,312	X			X										X					X	Negligible		Same as Alternative B
	8WTG53	X			X										X					X		Negligible	Same as Alternative B
KOP-32 Fire Island LH (Elevated 167 feet)	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-35 Twin Lights LH (Elevated 255 feet)	1,312	X			X					X			X		X				X		Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-36 Ashbury Park Hall – Top (Elevated 46.14 feet)	1,312	X			X					X			X		X				X		Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-37 Point O' Woods	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-39 Empire State Building (Elevated 1,263.1 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-40 Robert Moses Field – Nighttime	1,312	X			X										X					X	Negligible		Negligible (ADLS)
	853	X			X										X					X		Negligible	Negligible (ADLS)
KOP-A Recreational Fishing, Pleasure, and Tour Boat Area [1]	1,312	X			X			X			X				X		X				Major		Same as Alternative B
	853	X			X			X			X				X		X					Major	Same as Alternative B
KOP-B Commercial and Cruise Shipping Lanes [1]	1,312	X			X			X			X				X		X				Major		Same as Alternative B
	853	X			X			X			X				X		X					Major	Same as Alternative B

[1] Representative
LH = Lighthouse; HD = Historic District

Table H-46. Summary table for OCS-A 0539 viewer experience

Character Area	WTGs	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				OCS-A 0539 Impact Levels		
		Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration									
		High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-02 Lucy the Elephant	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-04 John Stafford Hall Beach Entrance	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall Balcony	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-08A/B Beach Haven – Daytime and Nighttime	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-10 Barnegate LH (Elevated 170 feet)	1,312	X			X				X			X			X			X			Moderate		Same as Alternative B
	853	X			X					X			X						X			Minor	Same as Alternative B
KOP-13 Mantoloking	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-18 Allenhurst Residential HD	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-26 Fort Tilden – Nighttime	1,312	X			X										X					X	Negligible		Negligible (ADLS)
	853	X			X										X					X		Negligible	Negligible (ADLS)
KOP-28 Jones Beach	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-30 Shinnecock Inlet	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-31-Westhampton Beach – Daytime	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-32 Fire Island LH (Elevated 167 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-35 Twin Lights LH (Elevated 255 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-36 Ashbury Park Hall – Top (Elevated 46.14 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-37 Point O' Woods	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-39 Empire State Building (Elevated 1,263.1 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-40 Robert Moses Field – Nighttime	1,312	X			X										X					X	Negligible		Negligible (ADLS)
	853	X			X										X					X		Negligible	Negligible (ADLS)
KOP-A Recreational Fishing, Pleasure, and Tour Boat Area [1]	1,312	X			X			X			X				X		X				Major		Same as Alternative B
	853	X			X			X			X				X		X					Major	Same as Alternative B
KOP-B Commercial and Cruise Shipping Lanes [1]	1,312	X			X			X			X				X		X				Major		Same as Alternative B
	853	X			X			X			X				X		X					Major	Same as Alternative B

[1] Representative
LH = Lighthouse; HD = Historic District

Table H-47. Summary table for OCS-A 0541 viewer experience

Character Area	WTGs	Sensitivity: Susceptibility High	Susceptibility Moderate	Susceptibility Low	Value High	Value Moderate	Value Low	Magnitude of Impact: Size and Scale of Change Large	Size and Scale of Change Medium	Size and Scale of Change Small	Geographic Extent Large	Geographic Extent Medium	Geographic Extent Small	Duration Permanent	Duration Long Term	Duration Short Term	Visibility Threshold Rating High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	OCS-A 0541 Impact Levels: 1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-02 Lucy the Elephant	1,312	X			X					X			X		X				X		Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-04 John Stafford Hall Beach Entrance	1,312	X			X					X			X		X				X		Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall Balcony	1,312	X			X					X			X		X				X		Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-08A Beach Haven – Daytime	1,312	X			X				X			X			X			X			Moderate		Same as Alternative B
	853	X			X					X			X		X				X			Minor	Same as Alternative B
KOP-08B Beach Haven – Nighttime	1,312	X			X				X			X			X			X			Moderate		Negligible (ADLS)
	853	X			X					X			X		X				X			Minor	Negligible (ADLS)
KOP-10 Barnegate LH (Elevated 170 feet)	1,312	X			X					X			X		X			X			Minor		Same as Alternative B
	853	X			X					X			X		X				X			Minor	Same as Alternative B
KOP-13 Mantoloking	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-18 Allenhurst Residential HD	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-26 Fort Tilden – Nighttime	1,312	X			X										X					X	Negligible		Negligible (ADLS)
	853	X			X										X					X		Negligible	Negligible (ADLS)
KOP-28 Jones Beach	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-30 Shinnecock Inlet	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-31-Westhampton Beach – Daytime	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-32 Fire Island LH (Elevated 167 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-35 Twin Lights LH (Elevated 255 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-36 Ashbury Park Hall – Top (Elevated 46.14 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-37 Point O' Woods	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-39 Empire State Building (Elevated 1,263.1 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-40 Robert Moses Field – Nighttime	1,312	X			X										X					X	Negligible		Negligible (ADLS)
	853	X			X										X					X		Negligible	Negligible (ADLS)
KOP-A Recreational Fishing, Pleasure, and Tour Boat Area [1]	1,312	X			X			X			X				X		X				Major		Same as Alternative B
	853	X			X			X			X				X		X					Major	Same as Alternative B
KOP-B Commercial and Cruise Shipping Lanes [1]	1,312	X			X			X			X				X		X				Major		Same as Alternative B
	853	X			X			X			X				X		X					Major	Same as Alternative B

[1] Representative
LH = Lighthouse; HD = Historic District

Table H-48. Summary table for OCS-A 0542 viewer experience

Character Area	WTGs	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				OCS-A 0542 Impact Levels		
		Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration									
		High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-02 Lucy the Elephant	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-04 John Stafford Hall Beach Entrance	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall Balcony	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-08A/B Beach Haven – Daytime and Nighttime	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-10 Barnegate LH (Elevated 170 feet)	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-13 Mantoloking	1,312	X			X					X			X		X				X	X	Minor		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-18 Allenhurst Residential HD	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-26 Fort Tilden – Nighttime	1,312	X			X										X					X	Negligible		Negligible (ADLS)
	853	X			X										X					X		Negligible	Negligible (ADLS)
KOP-28 Jones Beach	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-30 Shinnecock Inlet	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-31-Westhampton Beach – Daytime	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-32 Fire Island LH (Elevated 167 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-35 Twin Lights LH (Elevated 255 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-36 Ashbury Park Hall – Top (Elevated 46.14 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-37 Point O' Woods	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-39 Empire State Building (Elevated 1,263.1 feet)	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-40 Robert Moses Field – Nighttime	1,312	X			X										X					X	Negligible		Negligible (ADLS)
	853	X			X										X					X		Negligible	Negligible (ADLS)
KOP-A Recreational Fishing, Pleasure, and Tour Boat Area [1]	1,312	X			X			X			X				X		X				Major		Same as Alternative B
	853	X			X			X			X				X		X					Major	Same as Alternative B
KOP-B Commercial and Cruise Shipping Lanes [1]	1,312	X			X			X			X				X		X				Major		Same as Alternative B
	853	X			X			X			X				X		X					Major	Same as Alternative B

[1] Representative

LH = Lighthouse; HD = Historic District

Table H-49. Summary table for OCS-A 0544 viewer experience

Character Area	WTGs	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				OCS-A 0544 Impact Levels		
		Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration									
		High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-02 Lucy the Elephant	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-04 John Stafford Hall Beach Entrance	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall Balcony	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-08A/B Beach Haven – Daytime and Nighttime	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-10 Barnegate LH (Elevated 170 feet)	1,312	X			X					X			X		X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-13 Mantoloking	1,312	X			X					X			X		X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-18 Allenhurst Residential HD	1,312	X			X					X			X		X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-26 Fort Tilden – Nighttime	1,312	X			X					X			X		X					X	Negligible		Negligible (ADLS)
	853	X			X										X					X		Negligible	Negligible (ADLS)
KOP-28 Jones Beach	1,312	X			X				X			X			X				X		Minor		Same as Alternative B
	853	X			X					X			X		X				X			Minor	Same as Alternative B
KOP-30 Shinnecock Inlet	1,312	X			X										X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-31-Westhampton Beach – Daytime	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
	853	X			X					X			X		X					X		Negligible	Same as Alternative B
KOP-32 Fire Island LH (Elevated 167 feet)	1,312	X			X				X			X			X			X			Moderate		Same as Alternative B
	853	X			X				X			X			X			X				Moderate	Same as Alternative B
KOP-35 Twin Lights LH (Elevated 255 feet)	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
	853	X			X					X			X		X					X		Negligible	Same as Alternative B
KOP-36 Ashbury Park Hall – Top (Elevated 46.14 feet)	1,312	X			X					X			X		X					X	Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-37 Point O' Woods	1,312	X			X				X			X			X			X			Moderate		Same as Alternative B
	853	X			X				X			X			X			X				Moderate	Same as Alternative B
KOP-39 Empire State Building (Elevated 1,263.1 feet)	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
	853	X			X					X			X		X					X		Negligible	Same as Alternative B
KOP-40 Robert Moses Field – Nighttime	1,312	X			X			X			X				X		X				Major		Negligible (ADLS)
	853	X			X			X			X				X		X					Major	Negligible (ADLS)
KOP-A Recreational Fishing, Pleasure, and Tour Boat Area [1]	1,312	X			X			X			X				X		X				Major		Same as Alternative B
	853	X			X			X			X				X		X					Major	Same as Alternative B
KOP-B Commercial and Cruise Shipping Lanes [1]	1,312	X			X			X			X				X		X				Major		Same as Alternative B
	853	X			X			X			X				X		X					Major	Same as Alternative B

[1] Representative

LH = Lighthouse; HD = Historic District

Table H-50. Viewer experience summary table for six NY Bight projects

KOP	WTGs	Sensitivity						Magnitude of Impact									Visibility Threshold Rating				Six Projects Impact Levels		
		Susceptibility			Value			Size and Scale of Change			Geographic Extent			Duration									
		High	Moderate	Low	High	Moderate	Low	Large	Medium	Small	Large	Medium	Small	Permanent	Long Term	Short Term	High (5–6)	Moderate (3–4)	Low (1–2)	Unseen	1,312-Foot WTGs	853-Foot WTGs	Alternative C
KOP-02	1,312	X			X					X			X		X				X		Negligible		Same as Alternative B
Lucy the Elephant	853	X			X										X					X		Negligible	Same as Alternative B
KOP-04 John Stafford Hall-Beach	1,312	X			X					X			X		X				X		Negligible		Same as Alternative B
Entrance	853	X			X										X					X		Negligible	Same as Alternative B
KOP-05 Jim Whelan Hall-Balcony	1,312	X			X					X			X		X				X		Negligible		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-08A Beach Haven – Daytime	1,312	X			X				X			X			X			X			Moderate		Same as Alternative B
	853	X			X					X			X		X				X			Minor	Same as Alternative B
KOP-08B Beach Haven – Nighttime	1,312	X			X				X			X			X			X			Moderate		Negligible (ADLS)
	853	X			X					X			X		X				X			Minor	Negligible (ADLS)
KOP-10 Barnegat LH (Elevated 170	1,312	X			X				X			X			X			X			Moderate		Same as Alternative B
feet)	853	X			X					X			X		X				X			Minor	Same as Alternative B
KOP-13 Mantoloking	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
	853	X			X										X					X		Negligible	Same as Alternative B
KOP-18 Allenhurst Residential HD	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
	853	X			X								X		X				X			Minor	Same as Alternative B
KOP-26	1,312	X			X										X					X	Negligible		Negligible (ADLS)
Fort Tilden - Nighttime	853	X			X										X					X		Negligible	Negligible (ADLS)
KOP-28 Jones Beach	1,312	X			X				X			X			X			X			Minor		Same as Alternative B
	853	X			X					X			X		X				X			Minor	Same as Alternative B
KOP-30	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
Shinnecock Inlet	853	X			X										X					X		Negligible	Same as Alternative B
KOP-31- Westhampton Beach	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
Daytime	853	X			X										X					X		Negligible	Same as Alternative B
KOP-32 Fire Island LH-Upper Deck	1,312	X			X				X			X			X			X			Moderate		Same as Alternative B
(Elevated 167 feet)	853	X			X				X			X			X			X				Moderate	Same as Alternative B
KOP-35 Twin Lights LH (Elevated 255	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
feet)	853	X			X					X			X		X				X			Moderate	Same as Alternative B
KOP-36 Asbury Park Hall-Top	1,312	X			X										X				X		Negligible		Same as Alternative B
(Elevated 46.14 feet)	853	X			X										X					X		Negligible	Same as Alternative B
KOP-37	1,312	X			X				X			X			X			X			Moderate		Same as Alternative B
Point O' Woods	853	X			X				X			X			X			X				Moderate	Same as Alternative B
KOP-39 Empire State Building	1,312	X			X					X			X		X				X		Minor		Same as Alternative B
(Elevated 1,263.1 feet)	853	X			X										X					X		Negligible	Same as Alternative B
KOP-40	1,312	X			X			X			X				X		X				Major		Negligible (ADLS)
Robert Moses Field - Nighttime	853	X			X				X			X			X			X				Moderate	Negligible (ADLS)
KOP-A Recreational Fishing,	1,312	X			X			X			X				X		X				Major		Same as Alternative B
Pleasure, and Tour Boat Area [1]	853	X			X			X			X				X		X					Major	Same as Alternative B
KOP-B Commercial and Cruise	1,312	X			X			X			X				X		X				Major		Same as Alternative B
Shipping Lanes [1]	853	X			X						X				X		X					Major	Same as Alternative B

[1] Representative
LH = Lighthouse; HD = Historic District

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H.4 Cumulative Impacts of NY Bight Projects

NEPA requires consideration of other reasonably foreseeable activities in the project's viewshed and the project's incremental effects on open ocean character, seascape character, landscape character, and viewer experience. These effects include direct physical effects on the open ocean, seascape, and landscape or changes to the distinct character of the open ocean, seascape, and landscape.

Effects on open ocean character, seascape character, and landscape character can occur in the following conditions (SLVIA Chapter 8; BOEM 2021).

- Multi-project WTGs and OSSs visible within or from the open ocean character unit as overlapping or adjacent features and elements.
- Multi-project WTGs and OSSs visible from seascape character units as overlapping or adjacent features and elements.
- Multi-project WTGs and OSSs visible from landscape character units as overlapping or adjacent features and elements.

Effects on viewer experience can occur in the following conditions (SLVIA Chapter 8; BOEM 2021).

- Multi-project WTGs and OSSs visible as overlapping features and elements.
- Multi-project WTGs and OSSs visible as adjacent features and elements.
- Multi-project WTGs and OSSs visible as viewers move through the open ocean, seascape, and landscape.

Simulations of the incremental effects of the project in the context of other offshore wind projects are available on the BOEM website (https://www.boem.gov/renewable-energy/state-activities/new-york-bight). The KOP-based visual simulations portray 1,312-foot (400-meter) and 853-foot (260-meter) WTG predicted and maximum visibility for three construction and installation scenarios:

- The project construction (six NY Bight lease areas) without other foreseeable planned activities.
- The project construction with other foreseeable planned activities. 2024–2030 Project Construction includes Ocean Wind 1 OCS-A-0498, Empire Wind OCS-A 0512, Empire Wind II OCS-A 0512, Atlantic Shores Offshore Wind South OCS-A 0499, Atlantic Shores Offshore Wind North OCS-A 0539, and Ocean Wind 2 OCS-A532.
- Other foreseeable planned activities without the six NY Bight leases.

The number of offshore wind structures illustrated in the simulations differs from the number of structures assumed in Appendix D, *Planned Activities Scenario*. This is due to the timing of when Appendix D and simulations documents were developed, and the assumptions used in developing the layouts for the simulations. The number of offshore structures identified in both documents are estimates of reasonably foreseeable offshore wind development and are subject to change as lessees submit COPs and refine their development plans. BOEM believes the simulations presented on their website provide a reasonable approximation of the scale, contrast, and prominence of visual impacts that would occur from development of the NY Bight projects in combination with other ongoing and planned offshore wind projects.

The effects of other lease areas on open ocean character, seascape character, and landscape character are described in Table H-51. Increased impacts on the open ocean character area, seascape character areas, and landscape character areas stem from the effects of additional WTGs in view of the character areas. Effects include incremental expansions to the perceived geographic extents of lease areas' FOVs, greater magnitudes of character-changing turbines and substations, and increased daytime and nighttime vessel traffic. Simulations show that lease area proximities to character areas increase and decrease the character-changing interactions of key features and key elements. Those simulations showing beach views toward lease areas with visible WTGs' yellow bases and platforms, mid-tower lights, substations, hubs, nacelles, aviation lights, and rotors change seascape character more than views with more distant and fewer visible WTG elements.

The effects on open ocean character, seascape character, and landscape character of other lease areas in combination with the NY Bight projects are described in Table H-52.

The effects on viewer experience from non-NY Bight projects are described in Table H-53.

The effects on viewer experience of other lease areas in combination with the NY Bight projects are described in Table H-54.

Table H-51. Non-NY Bight projects' open ocean, seascape, and landscape areas cumulative lease area distances, FOVs, noticeable elements, visual contrasts, scale of change, and prominence

Lease Area and Incremental Date	Distance in Miles (Kilometers)[1] and Impacts			FOV Degrees (% of 124°)			Noticeable Elements[2] and Impact Level	Visual Contrast, Scale of Change, and Prominence					
	Seascape[4]	Open Ocean	Landscape[4]	Seascape	Open Ocean	Landscape		Form	Line	Color	Texture	Scale	Prominence[3]
Atlantic Shores Offshore Wind South OCS-A 0499 2026	8.7 (14.0) **Major**	0 (0)–42.5 (68.4) **Major**	9.0 (14.5) **Major**	136° (110%)	82° to 360° (66 to 290%)	136° (110%)	R, AL, N, H, O, M, Y Major	Strong	Strong	Strong	Strong	Large	6
Atlantic Shores Offshore Wind North OCS-A 0549 2030	9.0 (14.5) **Major**	0 (0)–42.5 (68.4) **Major**	9.2 (14.8) **Major**				R, AL, N, H, O, M, Y Major	Strong	Strong	Strong	Strong	Large	6
Empire Wind I and II OCS-A 0512 2030	14.1 (22.7) **Moderate**	0 (0)–40.7 (65.5) **Major**	34.9 (56.1) **Minor**				R, AL, N, H, O, M, Y Major	Strong	Strong	Strong	Strong	Large	6
Ocean Wind 1 OCS-A-0498 2025	15.3 (24.6) **Major**	0 (0)–39.6 (63.7) **Major**	15.5 (24.9) **Major**				R, AL, N, H, O, M, Y Major	Strong	Strong	Strong	Strong	Large	6
Ocean Wind 2 OCS-A532 2030	9.2 (14.7) **Major**	0 (0)–39.6 (63.7) **Major**	15.5 (24.9) **Major**				R, AL, N, H, O, M, Y Major	Strong	Strong	Strong	Strong	Large	6

[1] The most conservative onshore case involves the seaward edge of the beach nearest the projects. The seascape unit edge is 3.45 miles (5.6 kilometers) offshore (New Jersey jurisdictional boundary).

[2] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, O = OSS, M = mid-tower light, Y = yellow tower base color.

[3] WTGs and OSS Prominence (visibility): 0 = Not visible. 1 = Visible only after extended study; otherwise not visible. 2 = Visible when viewing in general direction of the lease areas; otherwise likely to be missed by casual observer. 3 = Visible after brief glance in general direction of the lease areas; unlikely to be missed by casual observer. 4 = Plainly visible; could not be missed by casual observer but does not strongly attract visual attention or dominate view. 5 = Strongly attracts viewers' attention to the lease areas; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 = Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (Sullivan et al. 2013).

[4] The seaward edge between landscape and seascape varies. The most conservative case is 0.2-mile (0.3-kilometer) landward distance from seaward beach edge.

Table H-52. NY Bight and other WTGs' cumulative open ocean, seascape, and landscape areas lease area distances, FOVs, noticeable elements, visual contrasts, scale of change, and prominence

Lease Area and Incremental Date	Distance in Miles (Kilometers)[1] and Impacts			FOV Degrees (% of 124°)			Noticeable Elements[2] and Impact Level	Visual Contrast, Scale of Change, and Prominence					
	Seascape[1]	Open Ocean	Landscape[4]	Seascape	Open Ocean	Landscape		Form	Line	Color	Texture	Scale	Prominence[3]
NY Bight (2030)	20.2 (32.6) **Moderate**	0 (0)–47.2 (68.4) **Major**	27.3 (44.0) **Minor**	136° (110%)	82° to 360° (66 to 290%)	136° (110%)	R, AL, N, H, O, M, Y Major	Strong	Strong	Strong	Strong	Large	6
Atlantic Shores Offshore Wind South OCS-A 0499 (2026)	8.7 (14.0) **Major**	0 (0)–42.5 (68.4) **Major**	9.0 (14.5) **Major**				R, AL, N, H, O, M, Y Major	Strong	Strong	Strong	Strong	Large	6
Atlantic Shores Offshore Wind North OCS-A 0549 (2030)	9.0 (14.5) **Major**	0 (0)–42.5 (68.4) **Major**	9.2 (14.8) **Major**				R, AL, N, H, O, M, Y Major	Strong	Strong	Strong	Strong	Large	6
Empire Wind I and II OCS-A 0512 (2030)	14.1 (22.7) **Moderate**	0 (0)–40.7 (65.5) **Major**	34.9 (56.1) **Minor**				R, AL, N, H, O, M, Y Major	Strong	Strong	Strong	Strong	Large	6
Ocean Wind 1 OCS-A-0498 (2025)	15.3 (24.6) **Major**	0 (0)–39.6 (63.7) **Major**	15.5 (24.9) **Major**				R, AL, N, H, O, M, Y Major	Strong	Strong	Strong	Strong	Large	6
Ocean Wind 2 OCS-A532 (2030)	9.2 (14.7) **Major**	0 (0)–39.6 (63.7) **Major**	15.5 (24.9) **Major**				R, AL, N, H, O, M, Y Major	Strong	Strong	Strong	Strong	Large	6

[1] The most conservative onshore case involves the seaward edge of the beach nearest the projects. The seascape unit edge is 3.45 miles (5.6 kilometers) offshore (New Jersey jurisdictional boundary).
[2] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, O = OSS, M = mid-tower light, Y = yellow tower base color.
[3] WTGs and OSS Prominence (visibility): 0 = Not visible. 1 = Visible only after extended study; otherwise not visible. 2 = Visible when viewing in general direction of the lease areas; otherwise likely to be missed by casual observer. 3 = Visible after brief glance in general direction of the lease areas; unlikely to be missed by casual observer. 4 = Plainly visible; could not be missed by casual observer but does not strongly attract visual attention or dominate view. 5 = Strongly attracts viewers' attention to the lease areas; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 = Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (Sullivan et al. 2013).
[4] The seaward edge between landscape and seascape varies. The most conservative case is 0.2-mile (0.3-kilometer) landward distance from seaward beach edge.

Table H-53. Non-NY Bight projects' cumulative viewer experience WTG distances, FOVs, noticeable elements, visual contrasts, scale of change, and prominence

KOP	Distance in Miles (Kilometers) and Impact ASOW South[1]	ASOW North[1]	EW I and II[1]	OW 1[1]	OW 2[1]	FOV Degrees (% of 124°)	Noticeable Elements [2] and Impact Level	Visual Contrast, Scale of Change, and Prominence Form	Line	Color	Texture	Scale	Prominence [3]
KOP-02 Lucy the Elephant	14.4 (23.2) **Major**	22.1 (35.6) **Moderate**	Not Visible	16.0 (25.8) **Moderate**	10.8 (17.3) **Major**	127.6° (103%)	R, AL, N, H Major	Strong	Strong	Strong	Strong	Large	6
KOP-04 John Stafford Beach Entrance	14.4 (23.2) **Major**	19.3 (31.0) **Moderate**	Not Visible	15.6 (25.1) **Moderate**	9.6 (15.5) **Major**	135.6° (109%)	R, AL, N, H Major	Strong	Strong	Strong	Strong	Large	6
KOP-05 Jim Whelan Hall Balcony	11.5 (18.4) **Major**	17.6 (28.4) **Moderate**	Not Visible	15.4 (24.8) **Moderate**	9.2 (14.7) **Major**	140.2° (113%)	R, AL, N, H Major	Strong	Strong	Strong	Strong	Large	6
KOP-08A/B Beach Haven – Day and Night	13.5 (21.7) **Major**	9.8 (15.8) **Major**	Not Visible	24.5 (39.4) **Minor**	20.2 (32.6) **Moderate**	139.7° (113%)	R, AL, N, H Major	Strong	Strong	Strong	Strong	Large	6
KOP-10 Barnegate Lighthouse (Elevation 157.2 feet)	27.3 (44.0) **Moderate**	10.1 (16.2) **Major**	50.2 (80.8) **Negligible**	38.6 (62.2) **Minor**	35.4 (57.0) **Minor**	169.6° (138%)	R, AL, N, H, O, and M Major	Strong	Strong	Strong	Strong	Large	6
KOP-13 Mantoloking	Not Visible	25.8 (41.5) **Moderate**	34.1 (54.9) **Minor**	Not Visible	Not Visible	42° (34%)	R, AL, N, H Moderate	Moderate	Moderate	Moderate	Moderate	Medium	3
KOP-18 Allenhurst Residential Historic District	Not Visible	39.0 (62.8) **Minor**	24.4 (39.3) **Moderate**	Not Visible	Not Visible	33.7° (27%)	R, AL, N, H Moderate	Moderate	Moderate	Moderate	Moderate	Medium	3
KOP-26 Fort Tilden	Not Visible	Not Visible	21.2 (33.9) **Moderate**	Not Visible	Not Visible	15.7° (13%)	R, AL, N, H Moderate	Moderate	Moderate	Moderate	Moderate	Medium	3
KOP-28 Jones Beach	Not Visible	Not Visible	14.2 (22.9) **Major**	Not Visible	Not Visible	52.4° (42%)	R, AL, N, H Major	Strong	Strong	Strong	Strong	Large	6
KOP-31 Westhampton Beach	Not Visible	Not Visible	37.9 (61.0) **Minor**	Not Visible	Not Visible	12.9° (10%)	R, AL Minor	Weak	Weak	Weak	Weak	Small	6
KOP-32 Fire Island Lighthouse (Elevation 154.7 feet)	Not Visible	Not Visible	21.7 (35.0) **Major**	Not Visible	Not Visible	61.7° (50%)	R, AL, N, H, O, and M Major	Strong	Strong	Strong	Strong	Large	6
KOP-35 Twin Lights Lighthouse (Elevation 204 feet)	Not Visible	50.0 (80.5) **Minor**	22.4 (36.1) **Major**	Not Visible	Not Visible	20.5° (16%)	R, AL, N, H Major	Strong	Strong	Strong	Strong	Large	6
KOP-36 Ashbury Park Hall (Elevation 46.4 feet)	Not Visible	38.1 (61.4) **Minor**	24.9 (40.0) **Moderate**	Not Visible	Not Visible	114.8° (93%)	R, AL, N, H Moderate	Moderate	Moderate	Moderate	Moderate	Medium	3
KOP-37 Point O' Woods	Not Visible	Not Visible	23.9 (38.5) **Moderate**	Not Visible	Not Visible	55.2° (44.5%)	R, AL, N, H, O, and M Major	Strong	Strong	Strong	Strong	Large	6
KOP-39 Empire State Building (Elevation 1,263 feet)	Not Visible	74.2 (119.5) **Negligible**	34.1 (54.9) **Minor**	Not Visible	Not Visible	59.5° (48%)	R, AL, N, H, O, and M Moderate	Moderate	Moderate	Moderate	Moderate	Medium	3
KOP-40 Robert Moses – Nighttime	Not Visible	Not Visible	21.3 (34.2) **Major**	Not Visible	Not Visible	62.9° (51%)	R, AL, N, H, O, and M Major	Strong	Strong	Strong	Strong	Large	6

[1] ASOW South = Atlantic Shores Offshore Wind South OCS-A 0499 (1,049-foot [319.7-meter] WTGs), ASOW North = Atlantic Shores Offshore Wind North OCS-A 0549 (1,049-foot [319.7-meter] WTGs), EW I and II = Empire Wind OCS-A 0512 (951-foot [290-meter] WTGs), OW 1 = Ocean Wind 1 OCS-A-0498 (906-foot [276-meter] WTGs), and OW2 = Ocean Wind 2 OCS-A532 (906-foot [276-meter] WTGs). Due to EC, zero atmospheric refraction, and known WTG heights. WTGs beyond 42.6 miles (68.6 kilometers) would not be visible from ground level plus 5.9 feet (1.8 meters) viewing height.

[2] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, O = OSS, M = mid-tower light, Y = yellow tower base color.

[3]WTGs and OSS (onshore) visibility: 0 = Not visible. 1 = Visible only after extended study; otherwise not visible. 2 = Visible when viewing in general direction of the lease areas; otherwise likely to be missed by casual observer. 3 = Visible after brief glance in general direction of the lease areas; unlikely to be missed by casual observer. 4 = Plainly visible; could not be missed by casual observer but does not strongly attract visual attention or dominate view. 5 = Strongly attracts viewers' attention to the lease areas; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 = Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (Sullivan et al. 2013).

Table H-54. NY Bight and other lease areas' cumulative viewer experience, lease area distances, FOVs, noticeable elements, visual contrasts, scale of change, and prominence

KOP	Distance in Miles (Kilometers) and Impact							FOV Degrees (% of 124°)	Noticeable Elements [2] and Impact Level[3]	Visual Contrast, Scale of Change, and Prominence					
	NYB 1,312-foot WTGs[1]	NYB 853-foot WTGs[1]	ASOW South[1]	ASOW North[1]	EW I and II[1]	OW 1[1]	OW 2[1]			Form	Line	Color	Texture	Scale	Prominence [3]
KOP-02 Lucy the Elephant	46.3 (74.4) **Negligible**	Not Visible	14.4 (23.2) **Major**	22.1 (35.6) **Moderate**	Not Visible	16.0 (25.8) **Moderate**	10.8 (17.3) **Major**	127.6° (103%)	R, AL, N, H, O, and M Major	Strong	Strong	Strong	Strong	Large	6
KOP-04 John Stafford Beach Entrance	43.8 (70.5) **Negligible**	Not Visible	14.4 (23.2) **Major**	19.3 (31.0) **Moderate**	Not Visible	15.6 (25.1) **Moderate**	9.6 (15.5) **Major**	135.6° (109%)	R, AL, N, H, O, and M Major	Strong	Strong	Strong	Strong	Large	6
KOP-05 Jim Whelan Hall Balcony	42.3 (68.1) **Negligible**	42.3 (68.1) **Negligible**	11.5 (18.4) **Major**	17.6 (28.4) **Moderate**	Not Visible	15.4 (24.8) **Moderate**	9.2 (14.7) **Major**	140.2° (113%)	R, AL, N, H, O, and M Major	Strong	Strong	Strong	Strong	Large	6
KOP-08A/B Beach Haven – Day and Night	32.6 (52.5) **Minor**	32.6 (52.5) **Minor**	13.5 (21.7) **Major**	9.8 (15.8) **Major**	Not Visible	24.5 (39.4) **Minor**	20.2 (32.6) **Moderate**	139.7° (113%)	R, AL, N, H, O, and M Major	Strong	Strong	Strong	Strong	Large	6
KOP-10 Barnegat Lighthouse (Elevation 157.2 feet)	32.3 (52.0) **Moderate**	32.3 (52.0) **Minor**	27.3 (44.0) **Moderate**	10.1 (16.2) **Major**	50.2 (80.8) **Negligible**	38.6 (62.2) **Minor**	35.4 (57.0) **Minor**	169.6° (138%)	R, AL, N, H, O, and M Major	Strong	Strong	Strong	Strong	Large	6
KOP-13 Mantoloking	44.1 (71.0) **Minor**	Not Visible	Not Visible	25.8 (41.5) **Moderate**	34.1 (54.9) **Minor**	Not Visible	Not Visible	138.1° (111%)	R, AL, N, H Moderate	Moderate	Moderate	Moderate	Moderate	Medium	3
KOP-18 Allenhurst Residential Historic District	42.5 (68.4) **Minor**	Not Visible	Not Visible	39.0 (62.8) **Minor**	24.4 (39.3) **Moderate**	Not Visible	Not Visible	116.2° (94%)	R, AL, N, H Moderate	Moderate	Moderate	Moderate	Moderate	Medium	3
KOP-26 Fort Tilden - nighttime	43.7 (70.3) **Negligible**	Not Visible	Not Visible	Not Visible	21.2 (33.9) **Moderate**	Not Visible	Not Visible	20.0° (16%)	R, AL, N, H Moderate	Moderate	Moderate	Moderate	Moderate	Medium	3
KOP-28 Jones Beach	31.4 (50.5) **Minor**	31.4 (50.5) **Minor**	Not Visible	Not Visible	14.2 (22.9) **Major**	Not Visible	Not Visible	60.5° (49%)	R, AL, N, H Major	Strong	Strong	Strong	Strong	Large	6
KOP-31 Westhampton Beach	33.9 (54.5) **Minor**	33.9 (54.5) **Negligible**	Not Visible	Not Visible	37.9 (61.0) **Minor**	Not Visible	Not Visible	22.3° (18%)	R, AL Minor	Weak	Weak	Weak	Weak	Small	6
KOP-32 Fire Island Lighthouse (Elevation 154.7 feet)	24.2 (39.0) **Moderate**	24.2 (39.0) **Moderate**	Not Visible	Not Visible	21.7 (35.0) **Major**	Not Visible	Not Visible	82.8° (67%)	R, AL, N, H, O, and M **Major**	Strong	Strong	Strong	Strong	Large	6
KOP-35 Twin Lights Lighthouse (Elevation 204 feet)	44.1 (70.9) **Minor**	44.1 (70.9) **Minor**	Not Visible	50.0 (80.5) **Minor**	22.4 (36.1) **Major**	Not Visible	Not Visible	89.5° (72%)	R, AL, N, H **Major**	Strong	Strong	Strong	Strong	Large	6
KOP-36 Ashbury Park Hall (Elevation 46.4 feet)	42.6 (68.6) **Negligible**	42.6 (68.6) **Negligible**	Not Visible	38.1 (61.4) **Minor**	24.9 (40.0) **Moderate**	Not Visible	Not Visible	117.8° (95%)	R, AL, N, H **Moderate**	Moderate	Moderate	Moderate	Moderate	Medium	3
KOP-37 Point O' Woods	24.1 (38.7) **Moderate**	24.1 (38.7) **Moderate**	Not Visible	Not Visible	23.9 (38.5) **Moderate**	Not Visible	Not Visible	82.3° (66%)	R, AL, N, H, O, and M **Major**	Strong	Strong	Strong	Strong	Large	6
KOP-39 Empire State Building (Elevation 1,263 feet)	55.8 (89.8) **Minor**	55.8 (89.8) **Negligible**	Not Visible	74.2 (119.5) **Negligible**	34.1 (54.9) **Minor**	Not Visible	Not Visible	63.4° (51%)	R, AL, N, H, O, and M **Moderate**	Moderate	Moderate	Moderate	Moderate	Medium	3
KOP-40 Robert Moses – Nighttime	24.2 (39.0) **Major**	24.2 (39.0) **Major**	Not Visible	Not Visible	21.3 (34.2) **Major**	Not Visible	Not Visible	80.4° (65%)	R, AL, N, H, O, and M **Major**	Strong	Strong	Strong	Strong	Large	6

[1] NYB = six New York Bight leases, ASOW South = Atlantic Shores Offshore Wind South OCS-A 0499 (1,049-foot [319.7-meter] WTGs), ASOW North = Atlantic Shores Offshore Wind North OCS-A 0549 (1,049-foot [319.7-meter] WTGs), EW I and II = Empire Wind OCS-A 0512 (951-foot 9290-meter] WTGs), OW 1 = Ocean Wind 1 OCS-A-0498 (906-foot [276-meter] WTGs), and OW 2 = Ocean Wind 2 OCS-A532 (906-foot [276-meter] WTGs). Due to EC, zero atmospheric refraction, and known WTG heights. WTGs beyond 42.6 miles (68.6 kilometers) would not be visible from ground level plus 5.9 feet (1.8 meters) viewing height.

[2] Noticeable elements: R = rotor, AL = aviation light, N = nacelle, H = hub, O = OSS, M = mid-tower light, Y = yellow tower base color.

[3] WTGs and OSS (onshore) visibility: 0 = Not visible. 1 = Visible only after extended study; otherwise not visible. 2 = Visible when viewing in general direction of the lease areas; otherwise likely to be missed by casual observer. 3 = Visible after brief glance in general direction of the lease areas; unlikely to be missed by casual observer. 4 = Plainly visible; could not be missed by casual observer but does not strongly attract visual attention or dominate view. 5 = Strongly attracts viewers' attention to the lease areas; moderate to strong contrasts in form, line, color, or texture, luminance, or motion. 6 = Dominates view; strong contrasts in form, line, color, texture, luminance, or motion fill most of the horizontal FOV or vertical FOV (Sullivan et al. 2013).

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Appendix I: NHPA Section 106 Summary

I.1 Project Overview

I.1.1 Background

This document provides a summary of the Bureau of Ocean Energy Management's (BOEM's) compliance with Section 106 of the National Historic Preservation Act (NHPA or Section 106) and documents the agency's consultation process for the development of a Programmatic Agreement that will guide Section 106 project-level review of the Construction and Operation Plans (COP) for six commercial wind energy lease areas (OCS-A 0537, 0538, 0539, 0541, 0542, and 0544) in the New York Bight (NY Bight). This Section 106 summary (Summary) is included as an appendix to the Programmatic Environmental Impact Statement (PEIS) being prepared in compliance with the National Environmental Policy Act (NEPA).

This is the first time that BOEM is considering the development of a Programmatic Agreement for a grouping of lease areas after lease issuance and before submittal of COPs, but it builds from other efforts BOEM has made to identify programmatic solutions for meeting the agency's obligations under Section 106. BOEM has already implemented programmatic agreements pursuant to 36 Code of Federal Regulations (CFR) 800.14(b) to fulfill its obligations under Section 106 of the NHPA for renewable energy activities on the Outer Continental Shelf (OCS) offshore New York and New Jersey. These agreements have been developed for two primary reasons: first, BOEM's decisions to issue leases and approve plans (e.g. Site Assessment Plans [SAPs], COPs, or General Activity Plans [GAPs]) are complex and involve multiple stages of decision-making and multiple undertakings; and second, BOEM will not have the results of archaeological surveys prior to the issuance of leases or grants and, as such, will be conducting historic property identification and evaluation efforts in phases (36 CFR 800.4(b)(2)). The *Programmatic Agreement Among The U.S. Department of the Interior, Bureau of Ocean Energy Management, The State Historic Preservation Officers of New Jersey and New York, The Shinnecock Indian Nation, and The Advisory Council on Historic Preservation Regarding Review of Outer Continental Shelf Renewable Energy Activities Offshore New Jersey and New York Under Section 106 of the National Historic Preservation Act* (NJ-NY PA) was executed June 3, 2016[1] by BOEM, the State Historic Preservation Officers (SHPOs) of New York and New Jersey, and the Advisory Council on Historic Preservation (ACHP). This agreement provides for Section 106 consultation to continue through BOEM's decision-making process and allows for a phased identification and evaluation of historic properties (36 CFR 800.4(b)(2)).

The current programmatic review of the six NY Bight lease areas seeks to compile baseline information, where feasible, and identify key concepts to incorporate into a standardized process that will guide each of the six project-level reviews. By capturing the results in this Summary and a supplemental

[1] https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/HP/NY-NJ-Programmatic-Agreement-Executed.pdf

programmatic agreement for NY Bight, BOEM seeks to achieve greater consistency across the six lease areas while reducing the consultation burden for consulting Tribes, SHPOs, ACHP, and other parties.

I.1.2 Consultation with Tribes and Consulting Parties and Public Involvement

On July 15, 2022, BOEM contacted representatives of federally recognized Tribes, other federal agencies, state and local governments, preservation organizations, lessees of the six NY Bight lease areas, and other potentially interested consulting parties to determine their interest in participating as consulting parties. In the course of consultation activities, BOEM has identified additional organizations or agencies that may have an interest in the effects of offshore wind development on historic properties and has continued to invite such parties to participate in the programmatic Section 106 review. Consulting parties for the NHPA Section 106 Consultation of the NY Bight PEIS as of December 1, 2023, are listed in Table I-1. BOEM will continue consulting with federally recognized Tribes, New Jersey SHPO, New York SHPO, ACHP, and other consulting parties regarding the project-level review procedures and the development of programmatic avoidance, minimization, mitigation, and monitoring (AMMM) measures that could be adopted at the individual COP NEPA-Section 106 review stage to resolve adverse effects on historic properties.

Table I-1. Participating Section 106 consulting parties for the NY Bight

Organization Type	Participating Consulting Parties
Federally Recognized Tribe	Absentee-Shawnee Tribe of Indians of Oklahoma
Federally Recognized Tribe	Delaware Tribe of Indians
Federally Recognized Tribe	Eastern Shawnee Tribe of Oklahoma
Federally Recognized Tribe	Mashantucket (Western) Pequot Tribal Nation
Federally Recognized Tribe	Mashpee Wampanoag Tribe
Federally Recognized Tribe	Mohegan Tribe of Connecticut
Federally Recognized Tribe	Stockbridge-Munsee Community Band of Mohican Indians
Federally Recognized Tribe	The Delaware Nation
Federally Recognized Tribe	The Narragansett Indian Tribe
Federally Recognized Tribe	The Shinnecock Indian Nation
Federally Recognized Tribe	Wampanoag Tribe of Gay Head (Aquinnah)
Federal Government	U.S. Army Corps of Engineers
Federal Government	U.S. Advisory Council on Historic Preservation
Federal Government	U.S. Bureau of Safety and Environmental Enforcement
Federal Government	U.S. Environmental Protection Agency
Federal Government	U.S. National Park Service
Lessee	Atlantic Shores Offshore Wind Bight (OCS-A 0541)
Lessee	Attentive Energy (OCS-A 0538)
Lessee	Bluepoint Wind (OCS-A 0537)
Lessee	Community Offshore Wind (OCS-A 0539)
Lessee	Invenergy (OCS-A 0542)
Lessee	Vineyard Mid-Atlantic Offshore Wind (OCS-A 0544)
Local Government	Atlantic County
Local Government	Avon-by-the-Sea Borough
Local Government	Borough of Beach Haven

Organization Type	Participating Consulting Parties
Local Government	Borough of Highlands
Local Government	Borough of Point Pleasant Beach
Local Government	Borough of Sea Bright
Local Government	Borough of Seaside Park
Local Government	Borough of Spring Lake
Local Government	Cape May County
Local Government	City of Absecon
Local Government	City of Asbury Park
Local Government	City of Hoboken
Local Government	City of North Wildwood
Local Government	Monmouth County
Local Government	Monmouth County Park System
Local Government	Nassau County
Local Government	Suffolk County
Local Government	Town of Babylon
Local Government	Town of Islip
Local Government	Town of Oyster Bay
Local Government	Township of Brick
Local Government	Township of Hamilton
Local Government	Township of Middletown
Local Government	Township of Stafford
Local Government	Village of Bellport
Local Government	Village of Patchogue
Other Potentially Interested Parties	Green-Wood Cemetery
Other Potentially Interested Parties	Hempstead Harbor Protection Committee
Other Potentially Interested Parties	Point O' Woods Association
Preservation Organization	Bay Shore Historical Society
Preservation Organization	Greater Cape May Historical Society
Preservation Organization	Historic Districts Council
Preservation Organization	Historical Society of Highlands
Preservation Organization	Ocean City Historical Museum
Preservation Organization	Preservation Alliance of Spring Lake
Preservation Organization	Romer Shoal Light
Preservation Organization	Save Long Island Beach Inc.
Preservation Organization	The Noyes Museum of Art
Preservation Organization	West Bank Lighthouse
State Government	New Jersey State Museum
State Government	New York State Parks, Recreation & Historic Preservation, Long Island State Parks Region 9
State Government	New York State Parks, Recreation and Historic Preservation
State Government (SHPO)	New Jersey Department of Environmental Protection, Historic Preservation Office
State Government (SHPO)	New York State Historic Preservation Office
State Recognized Tribe	Lenape Indian Tribe of Delaware

BOEM conducted Section 106 early coordination meetings with ACHP on September 7, 2022, and with the New Jersey and New York SHPOs and ACHP on September 21, 2022 and January 10, 2023. BOEM conducted a Section 106 consultation meeting with consulting parties on March 13, 2023, to introduce the objectives for the NY Bight programmatic Section 106 review and solicit input on the development of the Programmatic Agreement. BOEM conducted a second Section 106 consultation meeting on August 3, 2023, to present an introduction to BOEM's analysis of impacts on scenic and visual resources including a preview of the development of photo simulations of development scenarios for the NY Bight lease areas and to provide an overview of BOEM's progress on the development of the Programmatic Agreement.

I.1.3 Programmatic Area of Potential Effect

BOEM has developed a NY Bight programmatic area of potential effects (Programmatic APE) in accordance with implementing regulations at 36 CFR part 800 (Protection of Historic Properties). In 36 CFR 800.16(d), the APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alteration in the character or use of historic properties, if any such properties exist."

BOEM (2020) further defines the APE as the following and pursuant to the Section 106 regulations definition of an APE (36 CFR 800.16(d)):

- The depth and breadth of the seabed potentially impacted by any bottom-disturbing activities;
- The depth and breadth of terrestrial areas potentially impacted by any ground-disturbing activities;
- The viewshed from which renewable energy structures, whether located offshore or onshore, would be visible;
- Any temporary or permanent construction or staging areas, both onshore and offshore.

BOEM has formed the Programmatic APE to facilitate the preliminary identification of historic properties listed in the National Register of Historic Places (NRHP) subject to potential effects from anticipated offshore wind development in the NY Bight area; initiate consultations with consulting parties; and analyze the adoption of potential AMMM measures for avoiding or reducing adverse effects on historic properties. Specific information, such as cable routes, landfall locations, and onshore transmission routes are not available at this time. Based on general information obtained from the lessees and other consulting parties, BOEM has defined a conservative Programmatic APE meant to encapsulate future COP-specific APEs when that information becomes available. BOEM will require each lessee to complete the requisite cultural resource technical studies per BOEM (2020) historic property identification guidelines including, but not limited to, the preliminary delineation of an APE per the COP Project Design Envelope (PDE), completion of associated cultural resource and historic property identification efforts, assessment of potential effects, and development of potential AMMM measures for identified historic properties. BOEM will then delineate the COP APE and assess the specific impacts for the PDEs of each NY Bight lease area in COP-specific NEPA and Section 106 reviews and consultations.

For the purposes of this analysis, cultural resources are divided into several types and subtypes as defined in Table I-2. Discussion of the cultural resource types in this section is further organized by their known or potential presence in the Programmatic APE.

Table I-2. Definitions of cultural resource types used in the analysis

Term	Definition
Ancient submerged landform feature	*Ancient submerged landform features* are landforms that have the potential to contain Native American archaeological resources inundated and buried as sea levels rose at the end of the last Ice Age. Additionally, Tribal Nations in the region may consider ancient submerged landform features to be independent or contributing elements to previously subaerial TCPs representing places where their ancestors once lived.
Cultural landscape	The National Park Service (2006) defines a *cultural landscape* as a "geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person, or exhibiting other cultural or aesthetic values." In this analysis, cultural landscapes are considered a type of historic aboveground resource.
Cultural resource	The phrase *cultural resource* refers to a physical resource valued by a group of people such as an archaeological resource, building, structure, object, district, landscape, or TCP. Cultural resources can date to the pre-Contact or post-Contact periods (i.e., respectively, the time prior to written records and thereafter) and may be listed on national, state, or local historic registers or be identified as important to a particular group during consultation, including any of those with cultural or religious significance to Tribal Nations. Cultural resources in this analysis are divided into several types and subtypes: marine cultural resources, terrestrial archaeological resources, historic aboveground resources, and TCPs.
Marine archaeological resource	*Marine archaeological resources* are the physical remnants of past human activity that occurred at least 50 years ago and are submerged underwater. They may date to the pre-Contact period (e.g., those inundated and buried as sea levels rose at the end of the last Ice Age) or post-Contact period (e.g., shipwrecks, downed aircraft, and related debris fields).
Historic aboveground resource	*Historic aboveground resources* are subaerial features or structures of cultural significance at least 50 years in age and include those that date to the pre-Contact or post-Contact periods. Example types that are or may have historic aboveground components include standing buildings, bridges, dams, historic districts, cultural landscapes, and TCPs.
Historic district	A *historic district* is an area composed of a collection of either or both archaeological and aboveground cultural resources.
Historic property	As defined in 36 CFR 800.16(l)(1), the phrase *historic property* refers to any "prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the [NRHP] maintained by the Secretary of the Interior. The term includes artifacts, records, and remains that are related to and located within such properties." *Historic property* also includes NHLs as well as properties of traditional religious and cultural importance to Native American Tribal Nations that meet NRHP criteria. The NRHP recognizes historic properties that are significant at the national, state, and local levels that possess integrity of location, design, setting, materials, workmanship, feeling, and association and that meet any of Criterion A through D. Criterion A covers a historic property that is associated

Term	Definition
	with events that are significant to the broad patterns of our history. Criterion B covers a historic property associated with the lives of persons significant to our past. Criterion C covers a historic property that embodies distinctive characteristics of a type, period, or method of construction; represents the work of a master or possesses high artistic values; or represents a significant and distinguishable entity whose components may lack individual distinction. Criterion D covers a historic property that yields, or may be likely to yield, information important to prehistory or history.
Terrestrial archaeological resource	*Terrestrial archaeological resources* are the physical remnants of past human activity that occurred at least 50 years ago and are located on or within lands not submerged underwater. They may date to the pre-Contact period (i.e., have associations with Native American populations dating to before European colonization of the Americas) or post-Contact period (i.e., have associations with African American, European American, or Native American populations dating to after European colonization of the Americas).
Traditional cultural property	National Register Bulletin 38 (Parker and King 1990, revised 1992 and 1998) defines a *traditional cultural property* as a "[historic property] that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community." TCPs may be locations, places, or cultural landscapes and have either or both archaeological and aboveground elements.

NHL = National Historic Landmark; TCP = traditional cultural property.

I.1.3.1 Marine Portion of the Programmatic APE

The marine portion of the Programmatic APE (Programmatic Marine APE) includes the six NY Bight lease areas potentially affected by seabed-disturbing activities. When delineating the marine portion of the APE, BOEM considers the potential for the construction of offshore project components to physically disturb marine archaeological resources or ancient submerged landforms (ASLFs), either of which may qualify as historic properties. Delineating the area within which such effects may occur requires consideration of the locations where turbines or substations will be anchored to the seafloor within the lease area, as well as the corridors within which the interarray cables, transmission cables, and other project components may disturb the seabed between the lease area and coastal landfall. Other project activities that have the potential to physically disturb marine archaeological resources, such as interarray cables or use of anchors by vessels conducting surveys or supporting construction, may warrant expansion of the Marine APE.

The programmatic review of the NY Bight lease areas does not include delineation of a marine portion of the Programmatic APE due to the lack of complete project-specific design or layouts. In particular, the Programmatic APE has not considered other offshore areas, aside from the six NY Bight lease areas, potentially physically affected by seabed-disturbing activities (i.e., other marine areas in which temporary or permanent construction or staging areas are proposed to occur, such as offshore export cable route corridors and horizontal directional drilling [HDD] locations, which may have physical impacts on historic properties). Therefore, the potential for adverse effects will be considered based on hypothetical project activities that are typical of offshore wind renewable energy projects.

I.1.3.2 Terrestrial Portion of the Programmatic APE

When delineating the terrestrial portion of the APE, BOEM considers the potential for construction of onshore project components to physically disturb archaeological historic properties during ground-disturbing activities. Delineating the area within which such effects may occur requires locational information for where the subsea cables will make landfall, the location of terrestrial substations/converter stations, and the proposed routes for transmission, none of which are currently available. In addition to the location for such project components, the terrestrial APE needs to consider the maximum horizontal area and maximum vertical depth of ground disturbance at those locations.

The programmatic review of the NY Bight lease areas does not include delineation of a terrestrial portion of the Programmatic APE due to the lack of project-specific information about onshore areas potentially physically affected by ground-disturbing activities. Instead, the potential for adverse effects will be considered based on hypothetical project activities that are typical of offshore wind renewable energy projects.

I.1.3.3 Visual Portion of the Programmatic APE

When delineating the visual portion of the APE, BOEM considers the potential for offshore project components to cause adverse effects on onshore aboveground historic properties in those instances where a maritime view is a character-defining feature of the historic property and the introduction of the offshore wind facilities would reduce the integrity of that view. Delineating the area within which such effects may occur requires consideration of the viewshed modeling that is conducted according to BOEM's guidance for Visual Impacts Analysis (VIA).

For the programmatic review of the six lease areas in the NY Bight, BOEM has established a general study area for the visual analysis based on preliminary viewshed modeling (see Figure I-1). In general, the study area considers the visibility of a wind turbine generator (WTG) from the water level to the tip of an upright rotor blade at a height of 1,312 feet (400 meters), which is the maximum height of turbines considered in the PEIS Representative Project Design Envelope (RPDE) (refer to Chapter 2, Table 2-2 of the PEIS). This can be broken down to consider visibility from ground level or from an elevated viewpoint (such as the lookout room of a lighthouse or upper floors of a multi-story hotel). Such modeling can also consider visibility of the safety lights at the mid-level of the turbine, the hub of the turbine blades, or even the tip of the blades.

Geographic information system analysis was used to refine the study area and define a programmatic visual APE methodically through a series of steps. Once the study area was established (maximum theoretical distance WTGs could be visible), the analysis then accounted for how distance and Earth curvature impede visibility as the distance increases between the viewer and WTGs. This area was refined through computer modeling with the addition of a land cover vegetation layer to account for large areas of tall vegetation that limit projected visibility to a NY Bight project. Data layers for building footprints and building heights were then added to account for existing development projected to screen views to the NY Bight lease areas. Locations with unobstructed views of offshore elements then constituted the offshore visual APE (see Figure I-2).

The visual portion of the APE also includes consideration of the potential for onshore activities to include project components that cause adverse effects on onshore aboveground historic properties where introduction of the modern infrastructure would be incompatible with the historic character of the affected historic property. Such components may include cable landing locations, connection points where underground transmission lines connect aboveground, substations, switching stations, and overhead transmission line routes.

For the programmatic review of the six lease areas in the NY Bight there is not enough detail known about where the onshore project components will be located, so the onshore visual portion of the Programmatic APE has not been delineated. Consultation regarding the potential for visual adverse effects on onshore aboveground historic properties will focus on the types of impacts caused by onshore facilities that typically support offshore wind developments, rather than specific effects to specific historic properties.

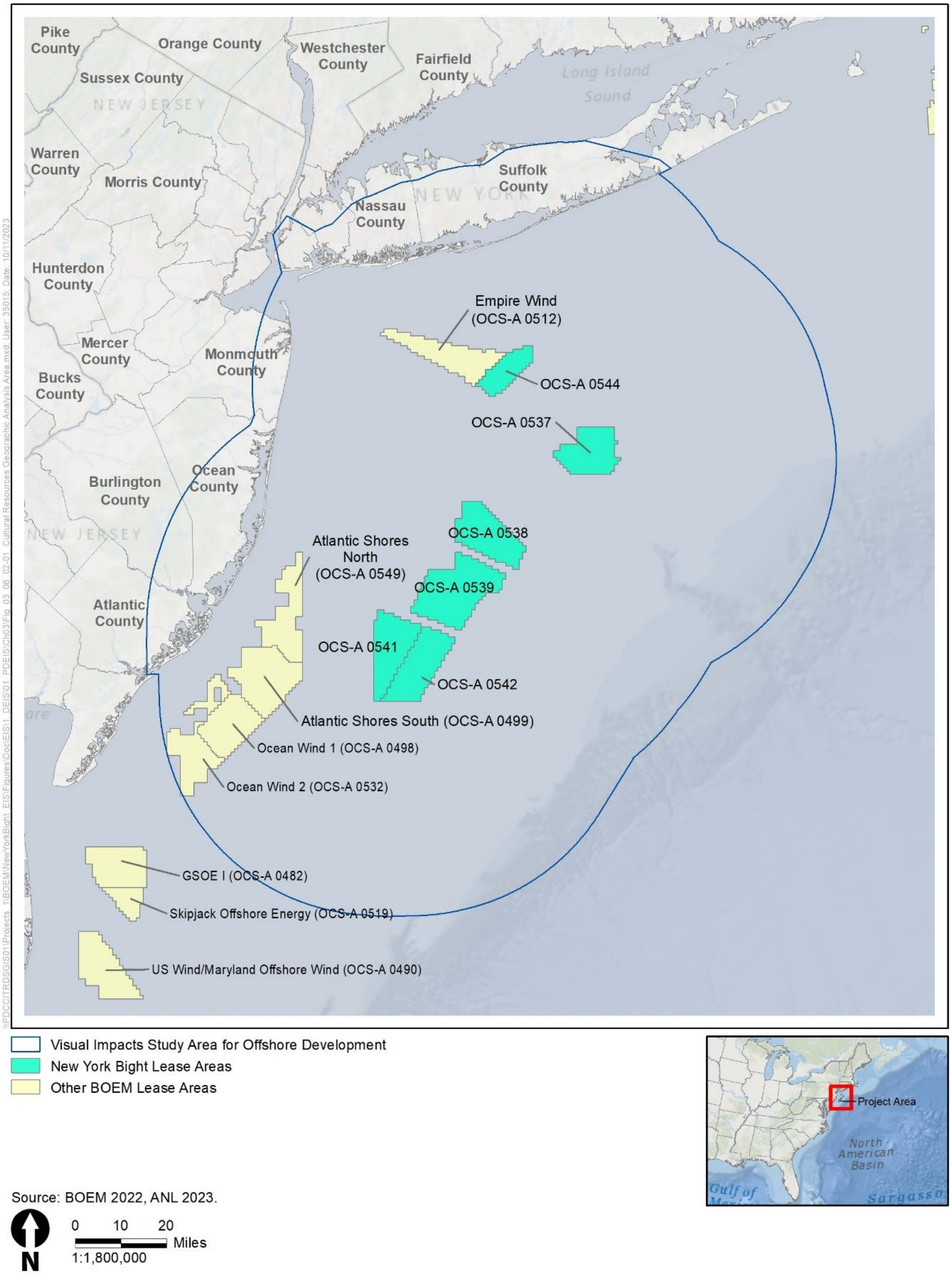

Figure I-1. Offshore visual impacts study area

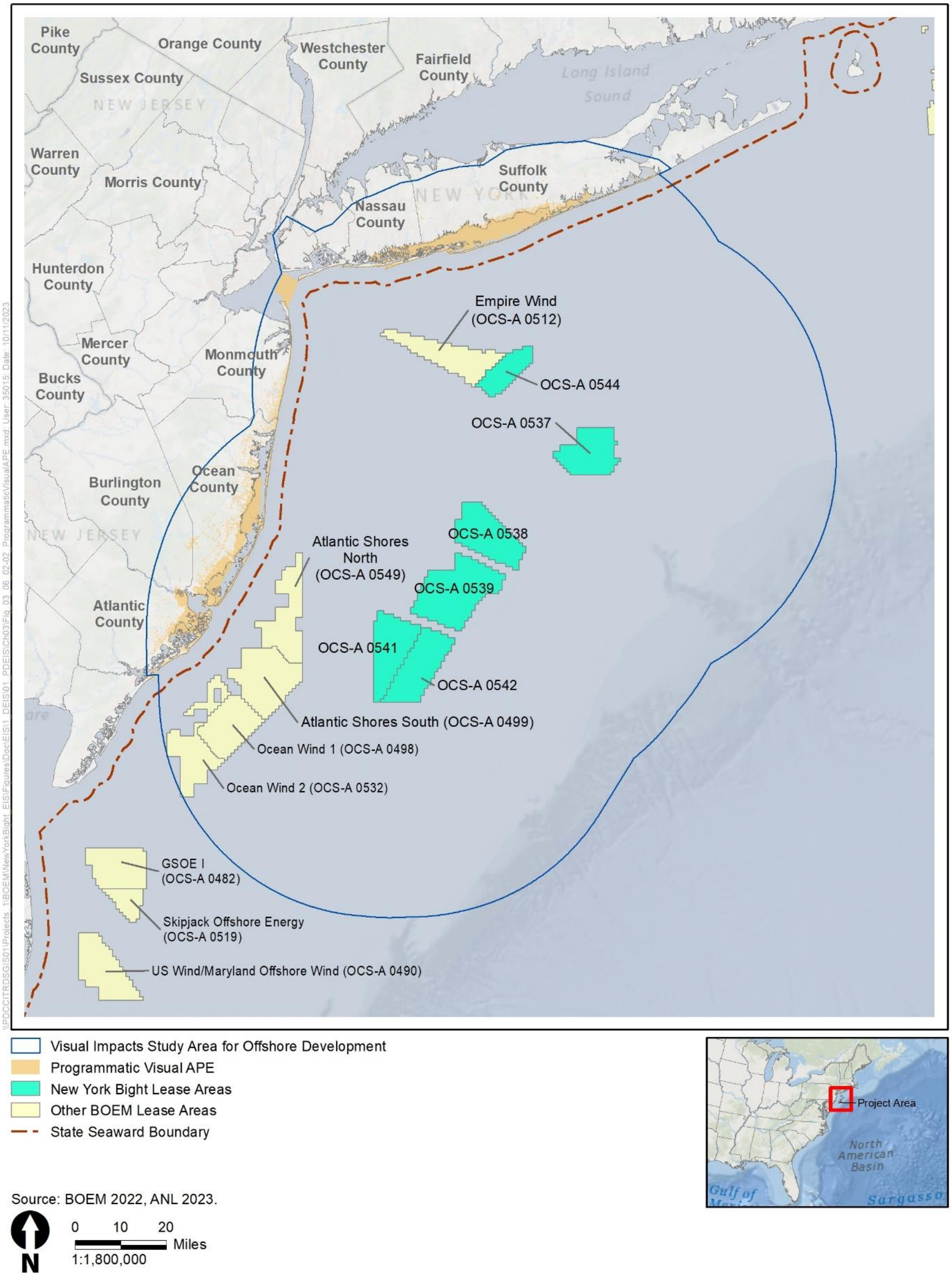

Figure I-2. Programmatic offshore visual APE

I.2 Historic Property Identification

I.2.1 Background Research

Background research and development of cultural and historic contexts were conducted by BOEM for the 2021 NY Bight Environmental Assessment, which assessed the potential impacts of the issuance of leases within the NY Bight wind energy areas (WEAs) and granting of easements, rights-of-way, and rights-of-use (BOEM 2021). These contexts have been incorporated into the PEIS and this Summary.

Table I-3 summarizes the cultural context of the Programmatic APE in New Jersey and New York (BOEM 2021).

Table I-3. Cultural context for the New York Bight cultural resources geographic analysis area

Period	Date	Description
Pre-Contact (Paleoindian)	15,000–10,000 BP	Semi-nomadic hunting and gathering populations. Use of broad spectrum of plants and animals for subsistence. Characteristic fluted projectile points used to hunt now-extinct large megafauna (mammoth and mastodon). Landscape of spruce forest. Sea levels about 330 feet (100 meters) below present-day levels. Sea level rise occurred with episodes of melting of the North American ice sheet. Deeply incised drainages along the OCS would have been estuarine environments utilized as a source of food and fresh water and habitation by Paleoindian populations. Flooding of these drainages allowed for sediment flows to bury possible Paleoindian sites.
Pre-Contact (Archaic)	10,000–3,000 BP	Period subdivided into Early (10,000–8,000 BP), Middle (8,000–6,000 BP), and Late (6,000–3,000 BP) phases. Gradual shift to modern environmental conditions with overall warmer temperatures and less precipitation relative to previous period. Spruce and pine forests gradually transition to mixed deciduous forest (hickory, oak, chestnut). Sea level had risen to about 75 feet (23 meters) below present-day levels by the Early Archaic and stabilized around 1.5–6.5 feet (0.5–2 meters) below present-day levels by the Late Archaic. Mobility of hunting and gathering populations decreased as environmental conditions stabilized. Population density increased and seasonal settlements were common with introduction of a broad range of seasonal food sources, including shellfish and other riverine and marine resources. Diverse types of stone tools used including ground stone vessels.
Pre-Contact (Woodland)	3,000–400 BP	Period subdivided into Early (3,000–2,000 BP), Middle (2,000–1,000 BP), and Late (1,000–400 BP) phases. Cooler and wetter climate in Early Woodland, then warming and drying trend begins in Middle Woodland. Mixed deciduous forests persist. Terrestrial foraging and intensive exploitation of marine food sources. Increasing sedentism with use of agriculture. Use of ceramic pots for cooking and storage. Triangular projectile points with introduction of bow and arrow by Late Woodland.
Post-Contact	17th Century AD	Native Americans settle in sedentary villages supported by agriculture and seasonal camps targeting large and small game, plants, riverine, and marine resources. Similar technologies to Late Woodland but increasing use of European trade goods. Interactions occur among Native Americans and European colonists. Dutch, Swedish, English colonies established. New Amsterdam colony established on Manhattan Island in 1625. New Sweden colony established in New Jersey in 1638. English colonists control the region by 1664.

Period	Date	Description
Post-Contact	18th Century AD	Shipbuilding and fish, tobacco, and fur trade industries thrive. First lighthouses on the Atlantic Seaboard are completed, including Sandy Hook in 1764. Ongoing conflicts between English and French colonists and their Native American allies. During the American Revolutionary War, many engagements between British and Continental forces took place in New Jersey and New York. Statehood granted to New Jersey in 1787 and to New York in 1788.
Post-Contact	19th Century AD	Manufacturing drives the economy during the Industrial Revolution. Cities grow as electricity is introduced and transportation improved through growth of public roadways, railroads, and canals. Iron and zinc mines become leading industries in New Jersey. New York City is a financial center during the American Civil War and remains a major ocean port and immigration hub. Ellis Island opened 1892.
Post-Contact	20th Century AD	African American populations increase with post-Civil War northward migrations. New Jersey and New York shipyards, factories, and refineries support military efforts in World War I and World War II. Many forts and training camps are active, and Port of New York used for troop deployments. Rail connections with larger urban areas and later improved roadways for automobiles led to growth of seaside communities. Urban decay in 1950s resulting from suburban growth.

Source: BOEM 2012; BOEM 2021.
AD = Anno Domini; BP = before present.

I.2.2 Historic Properties in the Marine Portion of the Programmatic APE

Marine cultural resources in the region include pre- and post-Contact marine archaeological resources and ASLFs on the OCS (BOEM 2012). Based on known historic and recent maritime activity in the region, the NY Bight lease areas have a high probability for containing shipwrecks, downed aircraft, and related debris fields that may be subject to potential impacts by seabed-disturbing activities from offshore wind development in the NY Bight area (BOEM 2012, 2021). These resources include both known and potential shipwrecks and related debris fields from the post-Contact period or last 50 years. ASLFs also have a high probability of occurrence on the OCS (BOEM 2012).

BOEM does not have enough information at this time about specific marine archaeological resources or ASLFs that may be present in the Programmatic Marine APE. BOEM will require each NY Bight lessee to conduct identification efforts for marine archaeological resources and ASLFs and present findings in a Marine Archaeological Resources Assessment (MARA) report prepared in partial fulfillment of a sufficient COP. This should include incorporation of information about marine cultural resources that have been identified as historic properties in the course of NEPA and Section 106 review of other nearby COPs (e.g., Empire Wind Offshore Wind [OCS-A 0512]), as the APE for those projects may overlap with the Programmatic APE for the NY Bight lease areas.

I.2.3 Historic Properties in the Terrestrial Portion of the Programmatic APE

The programmatic review of the NY Bight lease areas does not include delineation of a terrestrial portion of the Programmatic APE due to the lack of project-specific information about onshore areas potentially physically affected by ground-disturbing activities, and thus background research performed at this stage is unable to identify specific terrestrial archaeological resources for the programmatic review. BOEM will require each NY Bight lessee to conduct identification efforts for terrestrial archaeological resources and present findings in a Terrestrial Archaeological Resources Assessment (TARA) report prepared in partial fulfillment of a sufficient COP. This should include incorporation of information about terrestrial archaeological resources that have been identified as historic properties in the course of NEPA and Section 106 review of other lease areas that have already progressed into or completed NEPA and Section 106 review for their COPs, as the APE for those projects may overlap with the Programmatic APE for the NY Bight lease areas.

I.2.4 Historic Properties in the Visual Portion of the Programmatic APE

The viewshed of hypothetical offshore renewable energy structures constructed within the six NY Bight lease areas encompasses historically developed and densely occupied coastal areas of New Jersey and New York. As such, a large number of historic aboveground resources are anticipated to be located in the Programmatic Visual APE, of which a proportion are anticipated to be historic properties or potential historic properties listed or eligible for listing in the NRHP. These aboveground historic properties may include buildings, historic districts, cultural landscapes, and traditional cultural properties (TCPs). BOEM will require each NY Bight lessee to conduct identification efforts for historic aboveground resources and present findings in a Historic Resource Visual Effects Assessment (HRVEA) report prepared in partial fulfillment of a sufficient COP. BOEM will fully analyze impacts on such resources in COP-specific NEPA and Section 106 reviews and consultations.

I.3 Assessing Effects on Historic Properties

The effects of the NY Bight projects on historic properties cannot be fully analyzed at this time, as the layout and design details for each project are not yet known. However, in the course of conducting the analysis for the PEIS, and through input gained during the Section 106 consultation meetings, BOEM has been able to draw certain assessments and recommendations about types of effects that are likely to occur. The following section discusses the thresholds and methods for considering effects during the COP-level reviews, and is intended to create consistency across the six projects, which in turn will support more focused and meaningful project-level Section 106 consultation.

I.3.1 Criteria of Adverse Effect

The Criteria of Adverse Effect under NHPA Section 106 (36 CFR 800.5(a)(1)) states that an undertaking has an adverse effect on a historic property if the following occurs: “when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association.…Adverse Effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.” According to regulation, adverse effects on historic properties include, but are not limited to (36 CFR 800.5(a)(2)):

i. Physical destruction of or damage to all or part of the property;

ii. Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary of the Interior's standards for the treatment of historic properties (36 CFR part 68) and applicable guidelines;

iii. Removal of the property from its historic location;

iv. Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;

v. Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;

vi. Neglect of a property, which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian Tribe or Native Hawaiian organization; and

vii. Transfer, lease, or sale of property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

I.3.2 Marine Cultural Resources

Marine cultural resources in the region include pre- and post-Contact marine archaeological resources and ASLFs on the OCS (BOEM 2012). Based on known historic and recent maritime activity in the region, the NY Bight lease areas, composing the knowable Programmatic Marine APE, have a high probability for containing shipwrecks, downed aircraft, and related debris fields that may be subject to potential impacts by seabed-disturbing activities from offshore wind development in the NY Bight area (BOEM 2012, 2021). However, as mentioned in Section 3.6.2, *Cultural Resources,* the totality of cultural resources and historic properties in the Programmatic APE is not knowable at this time, and, therefore, while the background research performed at this stage has informed development of the cultural context and general sensitivity for marine cultural resources and ASLFs, BOEM does not have enough information to identify any specific marine archaeological resources or ASLFs that may be present in the Programmatic Marine APE.

Marine cultural resources such as shipwrecks and downed aircraft may be individually eligible for listing in the NRHP under Criterion A, B, or D. ASLFs may be individually eligible for listing in the NRHP or considered contributing elements to a TCP eligible for listing in the NRHP. ASLFs in the marine APE are considered archaeologically sensitive. If undiscovered archaeological resources are present within the identified ASLFs and they retain sufficient integrity, these resources could be eligible for listing in the NRHP under Criterion D, which is a resource that yields or may be likely to yield information important in prehistory or history. Furthermore, ASLFs are considered by Tribal Nations in the region to be culturally significant resources as the lands where their ancestors lived and as locations where events described in tribal histories occurred prior to inundation. BOEM recognizes these landforms could be eligible for listing in the NRHP under Criterion A.

The severity of project effects would depend on the extent to which integral or significant components of affected marine archaeological resources or ASLFs are disturbed, damaged, or destroyed, resulting in the loss of contributing elements to the historic property's eligibility for listing in the NRHP.

I.3.3 Terrestrial Archaeological Resources

The severity of effects would depend on the extent to which integral or significant components of affected archaeological resources are disturbed, damaged, or destroyed, resulting in the loss of contributing elements to the historic property's eligibility for listing in the NRHP.

I.3.4 Historic Aboveground Resources

BOEM's delineation of the visual portion of the Programmatic APE utilized a conservative viewshed from which hypothetical offshore wind structures in all six NY Bight lease areas measuring 1,312 feet (400 meters) in height would be visible (1,312 feet [400 meters] is the maximum height of turbines considered in the PEIS RPDE [refer to Chapter 2, Table 2-2]). As the developer for each lease area finalizes the layout within the lease area and the specifications for their offshore wind structures, the lease-specific preliminary APE can be delineated using the same methods that were used for the Programmatic APE. It is reasonable to expect that the viewsheds for each of the lease areas will be different from the hypothetical scenario analyzed in the programmatic review. The development of those APEs and the analysis that follows will be more credible in general, and consistent between lease areas, by using the methods developed during the programmatic review.

Assessing the effect of offshore project components generally involves the following steps:

1. Briefly summarize the historical significance of the historic property.
2. Characterize the views that comprise the character-defining views as they relate directly to the significance of the historic property. Include all character-defining views, both maritime and otherwise.
3. Describe what can be identified from Google Earth or Street View about other features in the vicinity that currently affect views from the historic property toward the character-defining maritime views (such as tall buildings between the property and the ocean, or if the property is on elevated ground).
4. Explain what can be extrapolated from the VIA performed for scenic resources, focusing on the nearest key observation point (KOP) and associated visual simulations.
5. State how all of the above would alter the historical integrity of the character-defining views, discussing the aspects of integrity related to feeling and setting relative to how one experiences the maritime character-defining views, and the aspect of association relative to how one understands the functional role of the ocean in the property's significance.
6. Conclude with a recommended finding of effect.

I.3.4.1 NY Bight Programmatic Visual Impact Analysis Key Observation Points

BOEM conducted an assessment of seascape, landscape, and visual impacts for the NY Bight lease areas, which is presented in Appendix H, *Seascape, Landscape, and Visual Impact Assessment*, and includes information on KOPs in the geographic analysis area and viewshed maps that depict what onshore areas will have visibility of the WTGs in the NY Bight lease areas. Visual simulations of the NY Bight projects and other ongoing and planned offshore wind projects in the geographic analysis area, produced by Truescape under contract to BOEM, are posted to BOEM's website for NY Bight: https://www.boem.gov/renewable-energy/state-activities/new-york-bight.

Designated KOP distances to the NY Bight projects' WTG and offshore substation (OSS) array would range from:

- 44.7 miles (71.9 kilometers) from KOP-30 Shinnecock Inlet near the northern extent of the study area;
- 24.1 miles (38.8 kilometers) from KOP-37 Point O' Woods, the closest New York KOP to the WTG array;
- 31.2 miles (50.2 kilometers) from KOP-09 Barnegat Jetty, the closest New Jersey KOP to the WTG array; and
- 49.1 miles (79.0 kilometers) from KOP-01 Ocean City Music Hall at the southern extent of the study area.

Figure I-3 illustrates the location of the KOPs relative to the visibility distances for the tower base (yellow), OSS (blue), mid-tower light (orange), hub, nacelle, and aviation lights (pink), and rotor tip blade (purple) for 1,312-foot (400-meter) WTGs. A total of 40 KOPs were selected for analysis as part of NY Bight's programmatic VIA. Of these, 26 locations were selected for their usefulness to the Section 106 programmatic review and consultation; these are the KOPs shown on Figure I-3. Table I-4 provides information about the 26 KOPs that represent historic properties or other locations relevant to the Section 106 programmatic review.

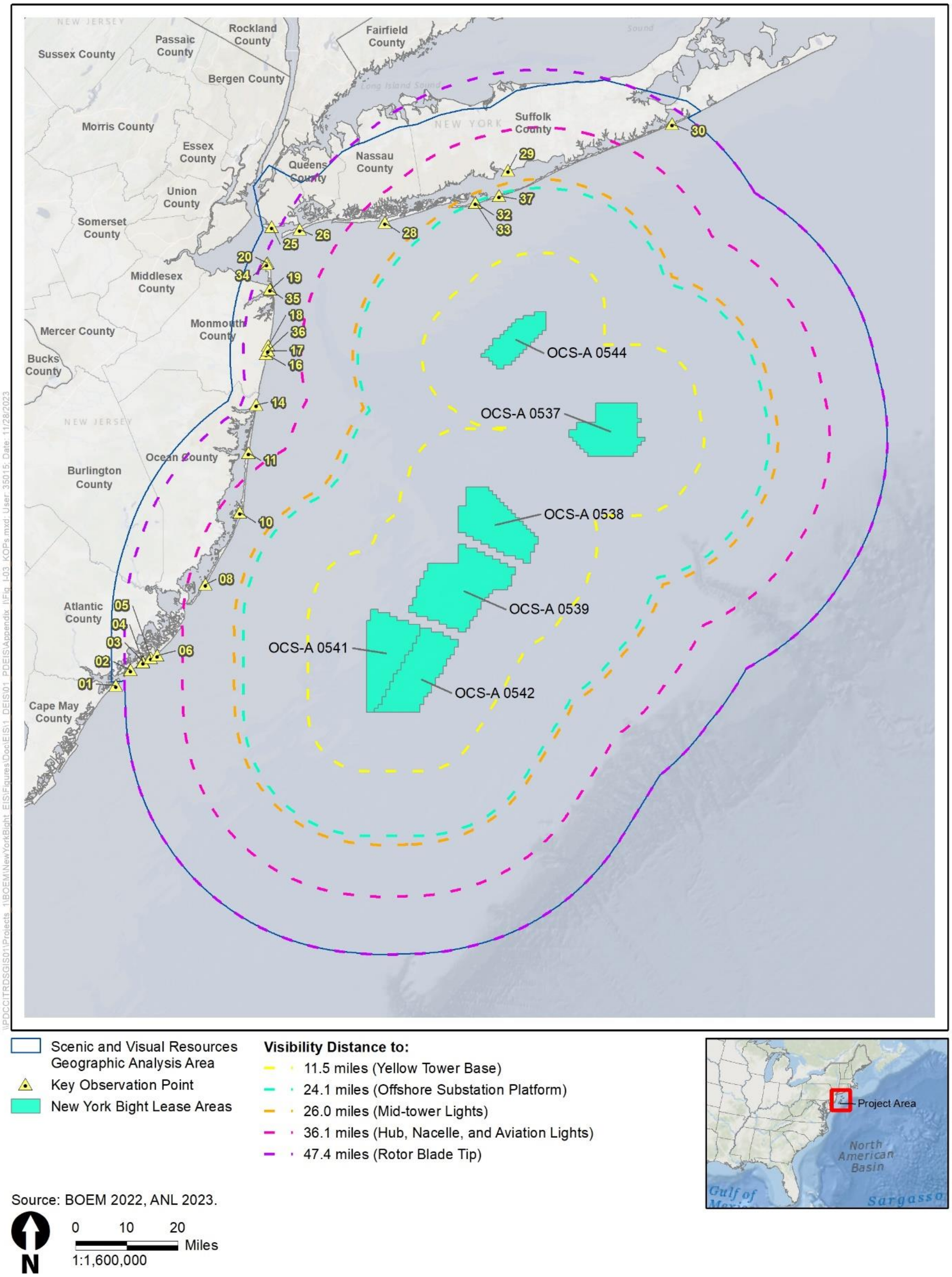

Figure I-3. Key observation points for NY Bight programmatic visual impact analysis

Table I-4. Key observation points that are also historic properties

KOP No.	Name	Rationale for Inclusion	Distance (miles) to nearest WTG/OSS	Simulation?
1	Ocean City Music Hall	Potential historic property	49.1	No
2	Lucy the Margate Elephant NHL	NHL with maritime setting/ocean view	46.3	Yes
3	Stafford Historic District/John Stafford Hall - Boardwalk	Historic property	43.8	No
4	Stafford Historic District/John Stafford Beach Entrance	Historic property	43.8	Yes
5	Atlantic City Convention Hall (Jim Whelan Hall) - Balcony	NHL with maritime setting/ocean view	42.3	Yes
6	Atlantic City Boardwalk - Ocean Casino Boardwalk View	Potential historic property	41.0	No
8	Beach Haven Historic District (Day and Night)	Historic property	32.6	Yes
10	Barnegat Lighthouse	Historic property	32.3	Yes
11	US Life Saving Station #14	Historic property	39.3	No
14	Bayhead Historic District	Historic property	44.5	No
16	Ocean Grove Historic District	Historic property	42.9	No
17	Asbury Park Beach and Convention Hall Balcony	Potential historic property	42.6	No
18	Allenhurst Residential Historic District	Historic property	42.5	Yes
19	Navesink Twin Lights NHL	NHL with maritime setting/ocean view	44.0	No
20	Sandy Hook Lighthouse NHL	NHL with maritime setting/ocean view	46.3	No
25	Coney Island Boardwalk	NHL with maritime setting/ocean view	48.8	No
26	Fort Tilden/Jacob Riis Park Historic District	Historic property	43.7	Yes
28	Jones Beach	Historic property	31.4	Yes
29	Rudolph Oyster House	NHL with maritime setting/ocean view	28.4	No
30	Shinnecock Inlet	Near Tribal territory	44.7	Yes
32	Fire Island Lighthouse - Upper Deck	Historic property	24.2	Yes
33	Fire Island Lighthouse - Base	Historic property	24.2	No
34	Sandy Hook Observatory NHL	NHL with maritime setting/ocean view	46.4	No
35	Navesink Light Station - Twin Lights Lighthouse NHL	NHL with maritime setting/ocean view	44.1	Yes
36	Asbury Park Hall	Potential historic property	42.6	Yes
37	Point O' Woods	Potential historic property	24.1	Yes

NHL = National Historic Landmark
Historic property = previously identified as eligible for or listed in the NRHP
Potential historic property = identified by BOEM or a consulting party as the location of a resource that requires further study to determine if it qualifies as an historic property.

I.3.5 Representative Visual Effects Analysis

The objective of a visual effects analysis is to assess how the introduction of offshore development (WTGs, OSSs) would change the relationship between an individual historic property and its maritime views, which could alter several aspects of historical integrity including feeling, setting, and association. It is important to note that not every historic property that has a view of the ocean necessarily relies on that maritime view to define its historical integrity. Each lessee will prepare project-level documentation of historic properties located within the preliminary APE for their lease, and must include a discussion of whether the maritime view is a character-defining feature of each NRHP eligible or listed historic property.

The effects of the project, and of cumulative effects of multiple projects, will need to be individually assessed for each historic property, based on its unique historical significance, relationship with the maritime view, and interpretation of the visual simulations for the nearest KOP. The programmatic consideration of potential effects is based on two WTG heights corresponding to the maximum and minimum heights in the PEIS RPDE: 1,312 feet (400 meters) and 853 feet (260 meters). By evaluating both heights, the analysis discloses the maximum and minimum impacts that may occur as a result of development in the NY Bight.

In general, for each historic property whose historical significance is associated with the maritime setting and that has retained the integrity of its maritime view, if the visual simulation from either that location or a comparable KOP location indicate that the WTGs would be visible, a finding of adverse effect is appropriate. For example, the simulated view of maximum visibility from KOP 03 Stafford Beach Entrance (Figure I-4) shows that the proposed development of 1,312-foot-tall (400-meter-tall) WTGs located 43.8 miles (70.5 kilometers) away would result in imperceptible changes to the maritime view. Historic properties with historically significant maritime views located in proximity to this KOP are unlikely to experience a visual adverse effect.

By contrast, the simulated view from KOP 32 Fire Island Lighthouse (Figure I-5) located 24.2 miles (39 kilometers) away and taken from an elevated view shows that the proposed offshore wind development with WTGs as short as 853 feet (260 meters) would be clearly visible and would degrade the integrity of the maritime setting and views. Historic properties that rely on a maritime view from an elevated vantage point as part of their NRHP eligibility and that are located in proximity to this KOP are likely to experience a visual adverse effect.

These examples illustrate multiple variables that are involved in the analysis of visual adverse effects and the importance of conducting a careful analysis of project specifics against the unique qualities that qualify each historic property for listing in the NRHP.

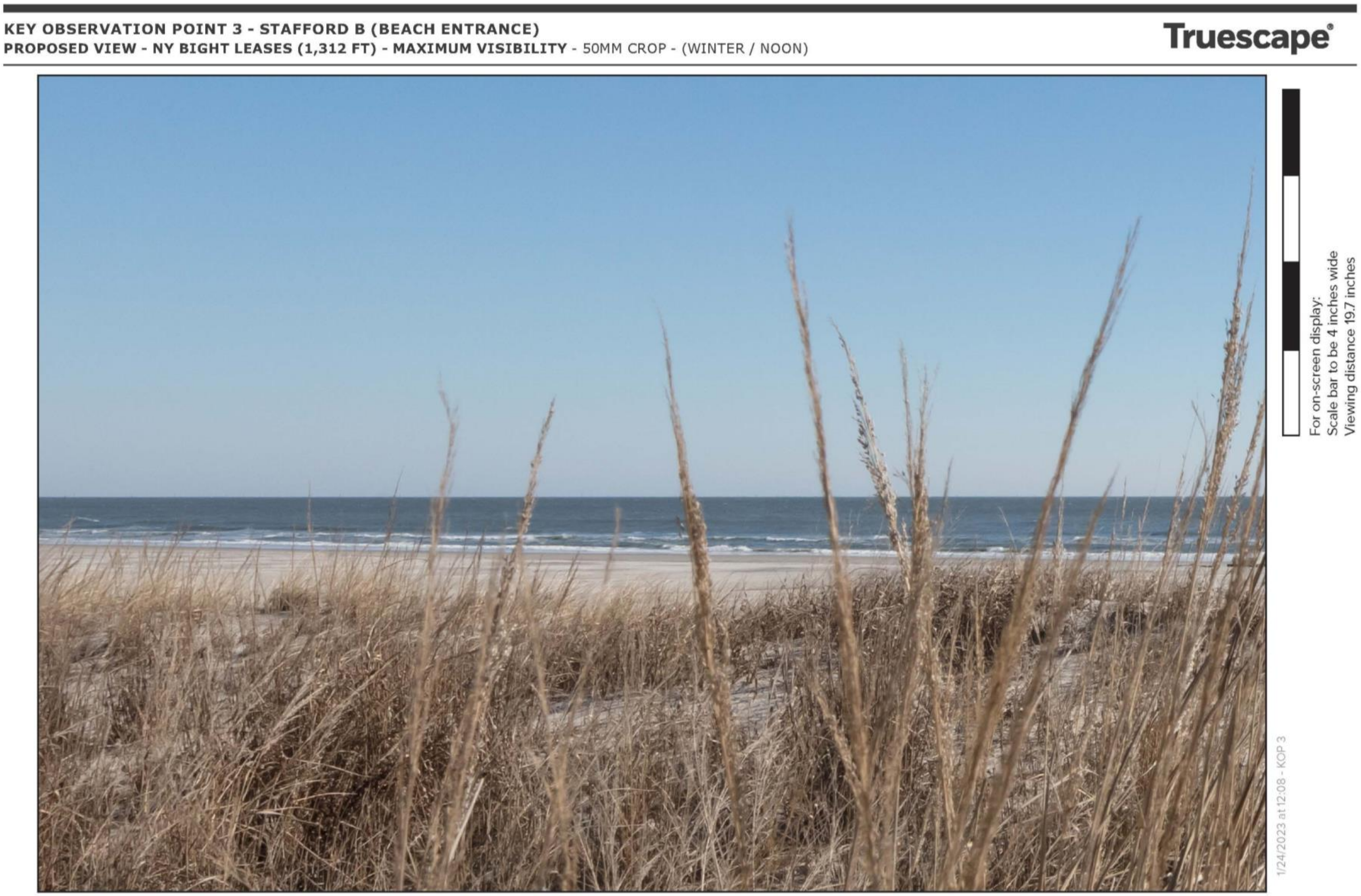

Figure I-4. KOP 03 Stafford Beach entrance

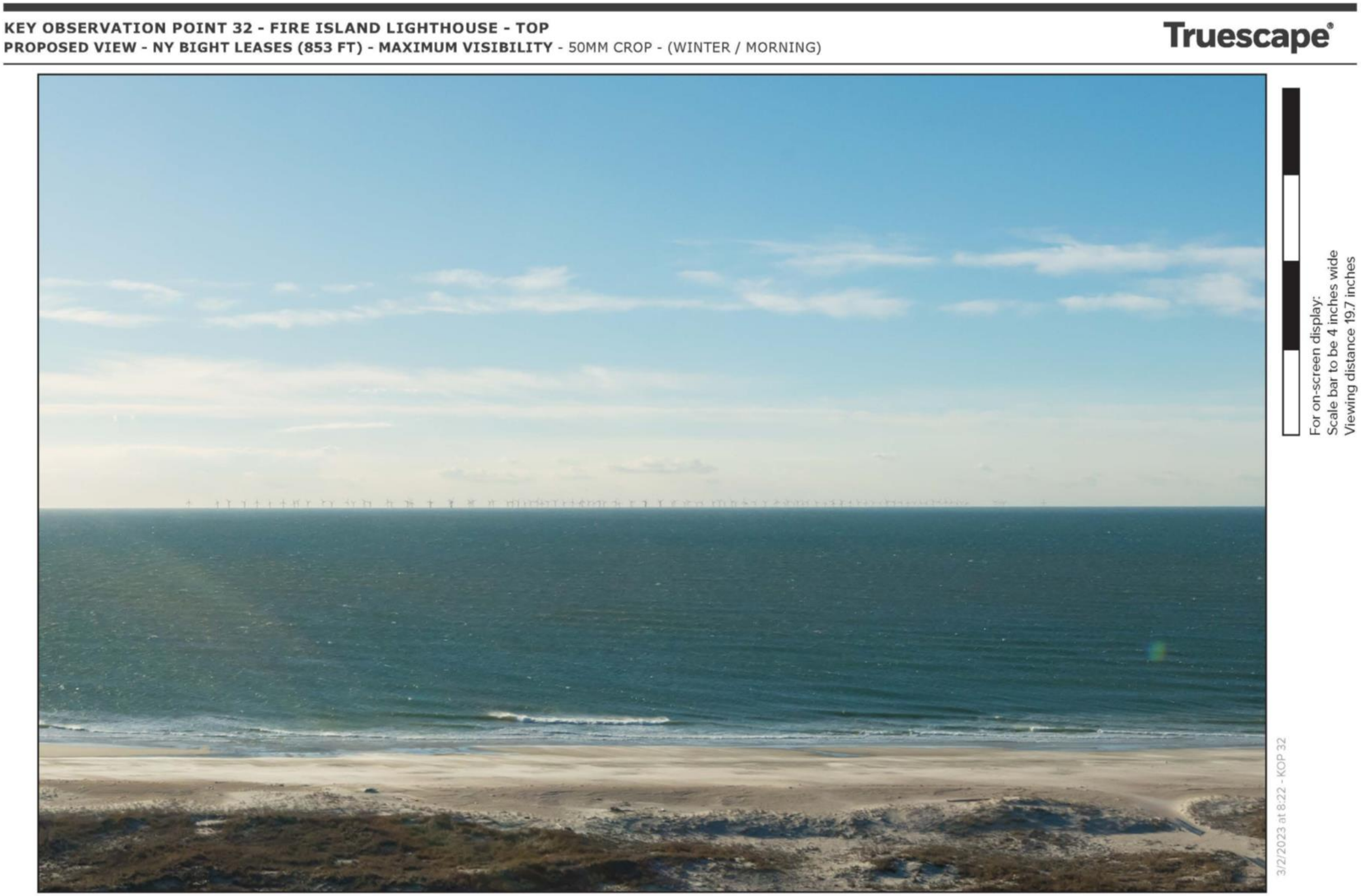

Figure I-5. KOP 32 Fire Island Lighthouse

BOEM does not anticipate that it will be necessary to prepare visual simulations for each of the historic properties located within each project's visual APE. However, it is unlikely that the visual simulations prepared for the PEIS will be sufficient, as project-specific details such as the height and spacing of the WTGs are likely to differ from the RPDE and the 853-foot (260-meter) and 1,312-foot (400-meter) assumptions used as a basis for creating the PEIS simulations. BOEM will review effects recommendations provided in the COP documents to determine sufficiency, and will consult with federally recognized Tribes, New Jersey SHPO, New York SHPO, ACHP, and other consulting parties regarding BOEM's preliminary findings of effect.

I.4 Programmatic Avoidance, Minimization, Mitigation, and Monitoring Measures

As an outcome of the Section 106 programmatic review of the NY Bight, the Programmatic Agreement for the NY Bight offshore wind activities will include a list of avoidance, minimization, and standard mitigation measures that can be selected in the event that adverse effects to historic properties are identified during project-level review. One or more standard mitigation measures will resolve an adverse effect on a historic property in the event that an adverse effect cannot be avoided.

The types of avoidance measures may include an agreement to completely avoid impacts on known or potential marine cultural resources identified during high-resolution remote sensing surveys. To facilitate complete avoidance of cultural resources may require the relocation of cables or WTGs through micrositing. Avoidance buffer zones will be designated for marine cultural resources (i.e., marine archaeological resources, such as known and potential shipwrecks and associated debris fields; and ASLFs) to ensure that any adverse bottom-disturbing activities do not occur near the cultural resources. In the event the known or potential cultural resource and/or its buffer zones cannot be completely avoided or in the event the cultural resource will be destroyed during construction activities, an archaeological investigation of the resource may be required to further determine appropriate mitigation measures or to completely document the cultural resources prior to the site's disturbance or destruction.

To minimize impacts on marine cultural resources, BOEM may also specify minimization measures that reduce impacts on sites. This may include the use of specific construction techniques, methods, or technologies/equipment that reduce the amount of seafloor impact or adverse effects on a cultural resource.

Implementing a combination of the following measures may avoid visual adverse effects: adjust WTG size, scale, and location to reduce visibility; implement sustainable outdoor lighting prescriptions that reduce impacts on night skies and visibility from coastlines; and place WTGs at distances to where the WTGs are not visible. BOEM will analyze implementation of these measures to determine levels of visual effect. If BOEM determines that adverse effects are present, then BOEM will provide recommended specifications that could feasibly meet the threshold of no visual adverse effect.

Potential programmatic minimization measures for visual effects include the following: use uniform WTG design, speed, height, and rotor diameter to reduce visual contrast and decrease visual clutter; apply a consistent color to the WTGs prior to commercial operation to reduce visual contrast during daytime hours; use uniform spacing of WTGs to decrease visual clutter; and use an aircraft detection lighting system (ADLS) to limit the time in which WTG lights are on and visible from adversely affected properties.

Based on the type of effect and the historic property adversely affected, possible mitigation measures can include the preparation of documentation in accordance with National Park Service guidance (https://www.nps.gov/subjects/heritagedocumentation/index.htm); historic preservation–related activity that could extend a historic property's existence and use following the Secretary of the Interior's Standards for the Treatment of Historic Properties (https://www.nps.gov/orgs/1739/secretary-standards-treatment-historic-properties.htm); education-related deliverables that enhance the public's understanding of the historic property's original setting and context (e.g., ethnographic research; website highlighting the local community or historic property's history; interpretation of heritage collections; historic preservation planning for that particular historic property or the types of historic properties in a municipality; climate change–related activities that would help extend the use of historic properties that are adversely affected such as a climate change resiliency plan).

BOEM has included measures for avoiding or reducing impacts on historic properties in the PEIS as part of the AMMM measures analyzed in Alternative C (refer to PEIS Section 3.6.2 and Appendix G, *Mitigation and Monitoring,* for a description of these measures). The AMMM measures are consistent with similar measures being developed in the NY Bight Programmatic Agreement for phased identification, post-review discoveries, consideration of standard mitigation measures, and preparation of treatment plans when adverse effects cannot be avoided. BOEM has consulted with the Section 106 consulting parties to receive feedback about the anticipated effectiveness of these measures, and to identify any additional measures for inclusion in the Programmatic Agreement and Final PEIS.

I.5 References

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Appendix J: Introduction to Sound and Acoustic Assessment

J.1 Sources of Underwater Sound

Ocean sounds originate from a variety of sources. Some come from non-biological sources such as wind and waves, while others come from the movements or vocalizations of marine life (Hildebrand 2009). In addition, humans introduce sound into the marine environment through activities like oil and gas exploration, construction, military sonars, and vessel traffic (Hildebrand 2009). The acoustic environment or "soundscape" of a given ecosystem comprises all such sounds—biological, non-biological, and anthropogenic (Pijanowski et al. 2011). Soundscapes are highly variable across space, time, and water depth, among other factors, due to the properties of sound transmission and the types of sound sources present in each area. A soundscape is sometimes called the "acoustic habitat," as it is a vital attribute of a given area where an animal may live (i.e., habitat) (Hatch et al. 2016).

J.2 Physics of Underwater Sound

Sounds are created by the vibration of an object within its medium (Figure J-1). This movement generates kinetic energy (KE), which travels as a propagating wave away from the sound source. As this wave moves through the medium, the particles undergo tiny back-and-forth movements (*particle motion*) along the axis of propagation, but the particles themselves do not travel with the wave. Instead, they oscillate in roughly the same location, transferring their energy to surrounding particles. The vibration is transferred to adjacent particles, which are pushed into areas of high pressure (i.e., compression) and low pressure (i.e., rarefaction). Acoustic pressure is a non-directional (i.e., scalar) quantity, whereas particle motion is an inherently directional quantity (i.e., a vector) taking place in the axis of sound transmission. The total energy of the sound wave includes the potential energy (PE) associated with the sound pressure as well as the KE from particle motion.

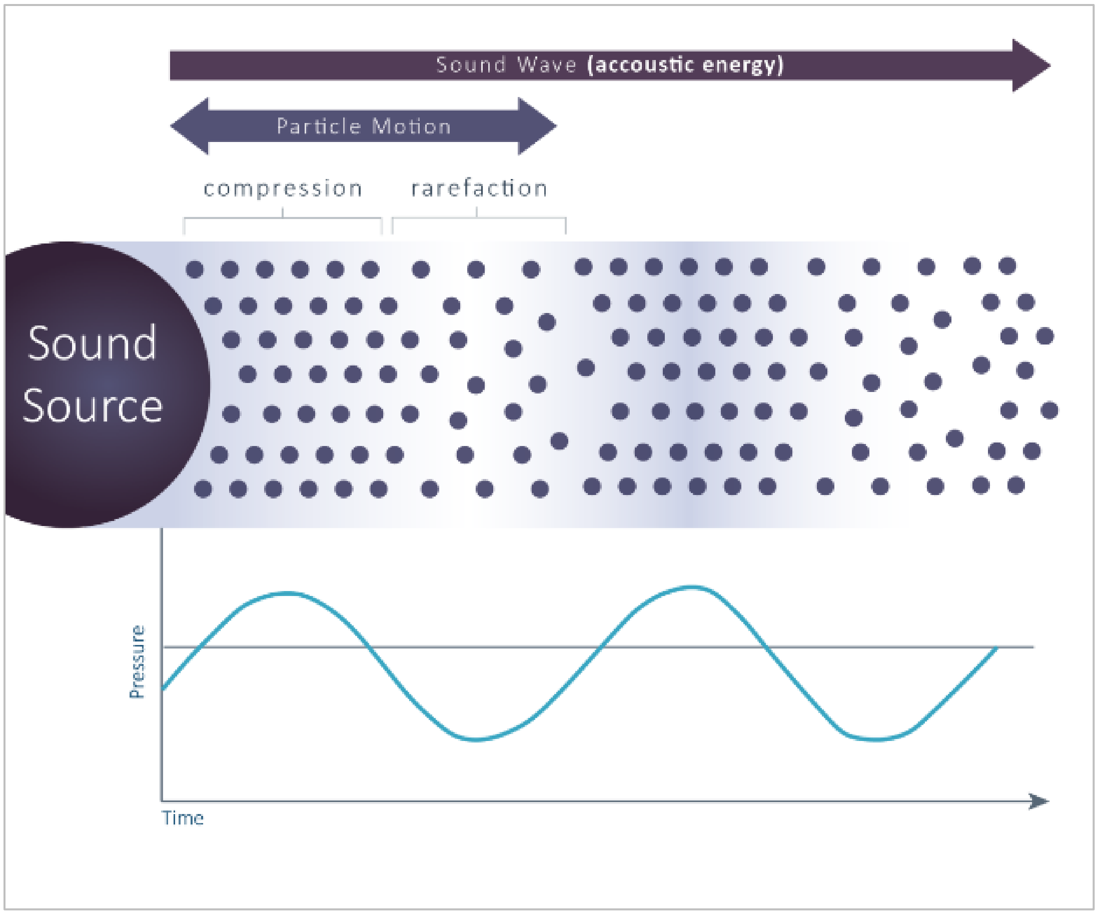

Figure J-1. Basic mechanics of a sound wave

J.2.1 Units of Measurement

Sound can be quantified and characterized based on a number of physical parameters. A complete description of the units can be found in ISO 18405:2017. Some of the major parameters and their International System of Units (SI) units (in parentheses) are as follows.

Acoustic pressure (pascal, Pa): The values used to describe the acoustic (or sound) pressure are peak pressure, peak-to-peak pressure, and root-mean-square (rms) pressure deviation. The peak sound pressure is defined as the maximum absolute sound pressure deviation within a defined time period and is considered an instantaneous value. The peak-to-peak pressure is the range of pressure change from the most negative to the most positive pressure amplitude of a signal (Figure J-2). The rms sound pressure represents a time-averaged pressure and is calculated as the square root of the mean (average) of the time-varying sound pressure over a given period (Figure J-2). The peak level (L_{pk}), peak-to-peak level ($L_{pk\text{-}pk}$), and sound pressure level (L_{rms} or SPL) are computed by multiplying the logarithm of the ratio of the peak or rms pressures to a reference pressure (1 microPascal [µPa] in water) by a factor of 20 and are reported in decibels, see **Sound levels** below.

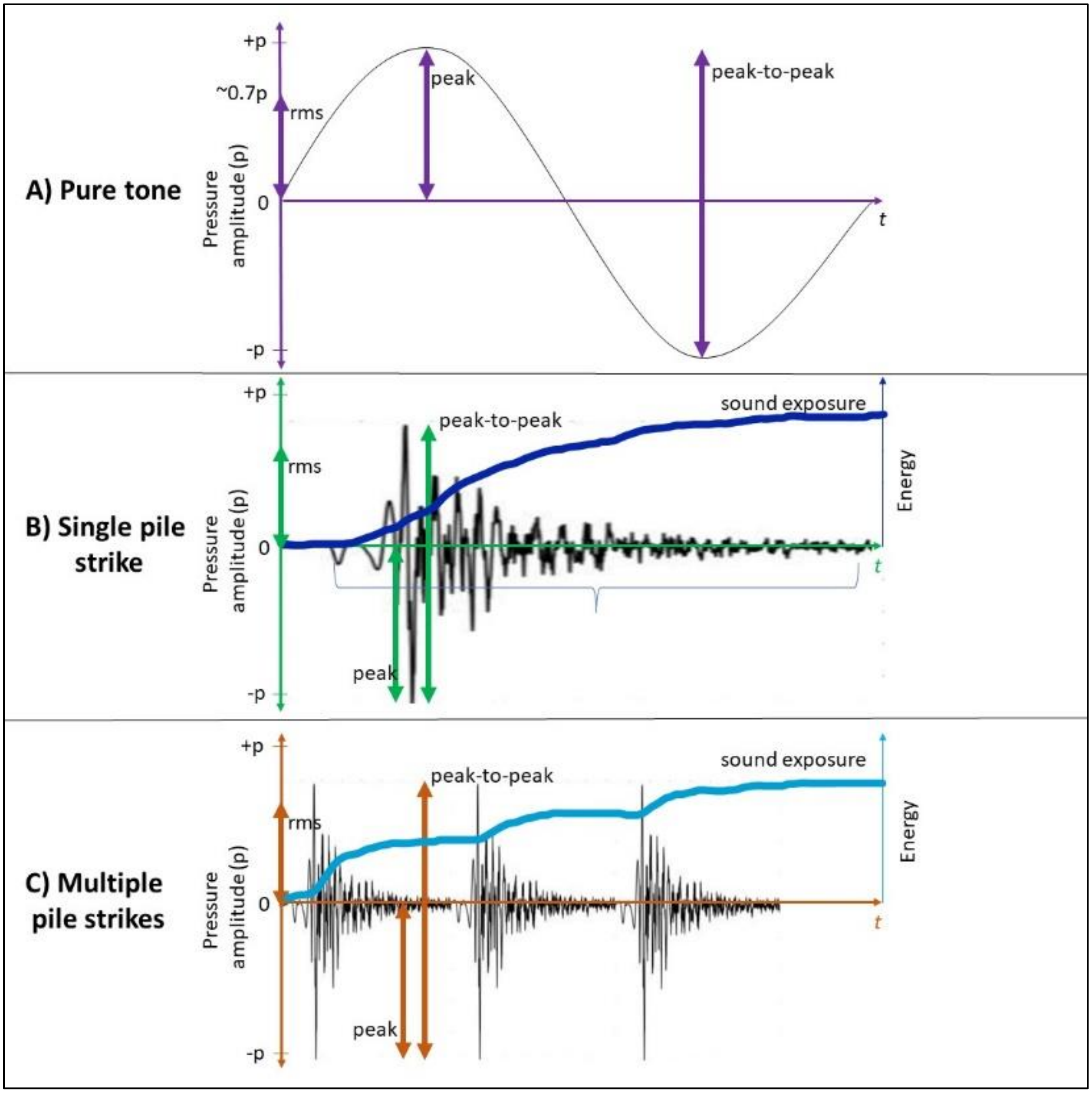

Figure J-2. Sound pressure wave representations of four metrics: root-mean-square (L_{rms}), peak (L_{pk}), peak-to-peak ($L_{pk\text{-}pk}$), and sound exposure level (SEL)

A) A sine wave of a pure tonal signal with equal positive and negative peaks, so peak-to-peak is exactly twice the peak and rms is approximately 0.7 x peak.

B) A single pile-driving strike with one large positive pulse and a large negative pulse that isn't necessarily the same magnitude. In this example, the negative pulse is more extreme so is the reported peak value, and the peak-to-peak is less than double that. Sound exposure is shown as it accumulates across the time window. The final sound exposure would be considered the "single-shot" exposure, and the rms value is that divided by the duration of the pulse.

C) Three consecutive pile-driving strikes with peak and peak-to-peak assessed the same way as in (B). Sound exposure is shown accumulating across all three strikes, and rms is the total sound exposure divided by the entire time window shown. The cumulative sound exposure for this series of signals would be considered the total energy from all three pile-strikes.

Particle velocity (meter per second, m/s): Particle velocity describes the change in position of the oscillating particles about its origin over a unit of time. Similar to sound pressure, particle velocity is dynamic and changes as the particles move back and forth. Therefore, peak particle velocity and root-mean-square particle velocity can be used to describe this physical quantity. One major difference between sound pressure and particle velocity is that the former is a scalar (i.e., without the directional component) and the latter is a vector (i.e., includes both magnitude and direction). Particle acceleration can also be used to describe particle motion, and is defined as the rate of change of velocity of a particle with respect to time. It is measured in units of meters per second squared, or m/s^2.

Sound exposure (pascal-squared second, or Pa^2-s): Sound exposure is proportional to the acoustic energy of a sound. It is the time-integrated squared sound pressure over a stated period or acoustic event (see Figure J-2). Unlike sound pressure, which provides an instantaneous or time-averaged value of acoustic pressure, sound exposure is cumulative over a period of time.

Acoustic intensity (watts per square meter, or W/m^2): Acoustic or sound intensity is the amount of acoustic energy that passes through a unit area normal to the direction of propagation per second. It is the product of the sound pressure and the sound velocity. With an idealized constant source, the pressure and particle velocity will vary in proportion to each other at a given location, but the intensity will remain constant.

Sound levels: There is an extremely wide dynamic range of values when measuring acoustic pressure in pascals, so it is customary to use a logarithmic scale to compress the range of values. Aside from the ease it creates for comparing a wide range of values, animals (including humans) perceive sound on a logarithmic scale. These logarithmic acoustic quantities are known as sound levels and are expressed in decibels (dB), which is the logarithmic ratio of the measurement in question to a fixed reference value. Underwater acoustic sound pressure levels are referenced to a pressure of 1 µPa (equal to 10^{-6} pascals [Pa] or 10^{-11} bar). Note: airborne sound pressure levels have a different reference pressure: 20 µPa.

The metrics previously described (sound pressure, sound exposure, and acoustic intensity) can also be expressed as levels, and are commonly used in this way:

- Root-mean-square sound pressure level (L_{rms} or SPL, units of dB re 1 µPa)
- Peak pressure level (L_{pk}, units of dB re 1 µPa)
- Peak-to-peak pressure level (L_{pk-pk}, units of dB re 1 µPa)
- Sound exposure level (SEL, units of dB re 1 $µPa^2s$)

Note: A few commonly used time periods are used for SEL, including a 24-hour period (used in the United States for the regulation of noise impacts on marine mammals (SEL_{24}), or the duration of a single event, such as a single pile-driving strike or an air gun pulse, called the single strike SEL (SEL_{ss}). A sound exposure for some other period of time, such as the entire installation of a pile, may be written without a subscript (SEL), but in order to be meaningful, should always denote the duration of the event.

Source level: Another commonly discussed concept is source level. Source level is a representation of the amount of acoustic power radiated from the sound source being described. It describes how loud a particular source is in a way that can inform expected received levels at various ranges. It can be conceptualized as the product of the pressure at a particular location and the range from that location to a spherical (omnidirectional) source in an idealized infinite lossless medium. The source level is the sum of the received level and the propagation loss to that receiver. It is often discussed as what the received level would be 1 meter (m) from the source, but this can lead to confusion as an actual measurement at 1 m is likely to be impossible for large or non-spherical sources. The most common type is an SPL source level in units of dB re 1 µPa-m, though in some circumstances a SEL source level (in dB re 1 $\mu Pa^2 s\text{-}m^2$) may be expressed; peak source level (in units of dB re 1 µPa-m) may also be appropriate for some sources.

J.2.2 Propagation of Sound in the Ocean

Underwater sound can be described through a source-path-receiver model. An acoustic source emits sound energy that radiates outward and travels through the water and the seafloor. The sound level decreases with increasing distance from the acoustic source as the sound travels through the environment. The amount by which the sound levels decrease between the theoretical source level and a receiver is called *propagation loss.* Among other things, the amount of propagation loss that occurs depends on the source-receiver separation, the geometry of the environment the sound is propagating through, the frequency of the sound, the properties of the water column, and the properties of the seafloor and sea surface.

When sound waves travel through the ocean, they may encounter areas with different physical properties that will likely alter the propagation pathway of the sound, compared to a homogenous and boundaryless environment. For example, near the ocean's surface, water temperature is usually higher, resulting in relatively fast sound speeds. As temperature decreases with increasing depth, the sound speed decreases. Sounds bend toward areas with lower speeds (Urick 1983). Ocean sound speeds are often slowest at mid-latitude depths of about 1,000 m, and because of sound's preference for lower speeds, sound waves above and below this "deep sound channel" often bend towards it. Sounds originating in this layer can travel great distances. Sounds can also be trapped in the mixed layer near the ocean's surface (Urick 1983). Latitude, weather, and local circulation patterns influence the depth of the mixed layer, and the propagation of sounds near the surface is highly variable and difficult to predict.

At the boundaries near the sea surface and the sea floor, acoustic energy can be scattered, reflected, or attenuated depending on the properties at the surface (e.g., roughness, presence of wave activity, or bubbles) or seafloor (e.g., bathymetric features, substrate heterogeneity). For example, fine-grain sediments tend to absorb sounds well, while hard bottom substrates reflect much of the acoustic energy back into the water column. The presence of ice on the ocean's surface can also affect sound propagation. For example, the presence of solid ice may dampen sound levels by blocking surface winds. The presence of ice can also increase sound levels when pieces of ice break or scrape together (Urick 1983). The effect will also depend on the thickness and roughness of the ice, among many other factors related to the ambient conditions. As a sound wave moves from a source to a receiver (i.e., an animal), it may travel on multiple pathways that may be direct, reflected, refracted, or a combination of these mechanisms, creating a complex pattern of transmission across range and depth. The patterns may become even more complicated in shallow waters due to repeated interactions with the surface and the bottom, frequency-specific propagation, and more heterogenous seafloor properties. All of these variables contribute to the difficulty in reliably predicting the sound field in a given marine environment at any particular time.

J.2.3 Sound Source Classification

In the current regulatory context, anthropogenic sound sources are divided into four types: impulsive, non-impulsive, continuous, and intermittent, based on their differing potential to affect marine species (National Marine Fisheries Service [NMFS] 2018). Specifically, when it comes to potential damage to marine mammal hearing, sounds are classified as either impulsive or non-impulsive, and when considering the potential to affect behavior or acoustic masking, sounds are classified as either continuous or intermittent.

Impulsive noises are characterized as having (ANSI S1.13-2005, Finneran 2016):

- Broadband frequency content
- Fast rise-times and rapid decay times
- Short durations (i.e., <1 s)
- High peak sound pressures

Whereas the characteristics of non-impulsive sound sources are less clear but may be:

- Variable in spectral composition (i.e., broadband, narrowband, or tonal)
- Longer rise-time/decay times, and total durations compared to an impulsive sound
- Continuous (e.g., vessel engine radiated noise), or intermittent (e.g., echosounder pulses).

It is generally accepted that sources like explosions, air guns, sparkers, boomers, and impact pile-driving are impulsive and have a greater likelihood of causing hearing damage than non-impulsive sources. Impulsive sounds are more likely to induce physiological effects, including temporary threshold shift (TTS) and permanent threshold shift (PTS), than non-impulsive sounds with the same energy. This binary, at-the-source classification of sound types, therefore, provides a conservative framework upon which to predict potential adverse hearing impacts on marine mammals.

For behavioral effects of anthropogenic sound on marine mammals, NMFS classifies sound sources as either intermittent or continuous (NMFS 2018). Continuous sounds, such as drilling or vibratory pile-driving, remain "on," i.e., above ambient noise, for a given period of time, though this is not well-defined. An intermittent sound typically consists of bursts or pulses of sound on a regular on-off pattern, also called the duty-cycle. Examples of intermittent sounds are those from scientific echosounders, sub-bottom profilers, and even pile-driving. It is important to recognize that these delineations are not always practical in application, as a continuous yet moving sound source (such as a vessel passing over a fixed receiver) could be considered intermittent from the perspective of the receiver.

In reality, animals will encounter many signals in their environment that may contain many or all of these sound types, called complex sounds. And even for sounds that are impulsive at the source, as the signal propagates through the water, the degree of impulsiveness decreases (Martin et al. 2020). While there is evidence, at least in terrestrial mammals (Hamernik and Hsueh 1991), that complex sounds can be more damaging than continuous sounds, there is not currently a regulatory category for this type of sound. One current approach for assessing the impulsiveness of a sound that has gained attention is to compute the *kurtosis* of that signal. Kurtosis is a statistical measure that describes the prevalence of extreme values within a distribution of observations, in other words the “spikiness” of the data. By definition, a sound with a kurtosis value of 3 or less has very few extreme values and is generally considered *Gaussian* (i.e., normally distributed) noise. Martin et al. (2020) showed that a kurtosis value greater than 40 represents a distribution of observations with many extreme values and is very spiky. This generally describes an impulsive noise. A distribution of sound level observations from a time series with a kurtosis value somewhere in between these two values would be considered a complex sound.

J.3 Sound Sources Related to Offshore Wind Development

J.3.1 Geophysical and Geotechnical Surveys

Geophysical and geotechnical surveys are conducted to characterize the bathymetry, sediment type, and benthic habitat characteristics of the marine environment. They may also be used to identify archaeological resources or obstacles on the seafloor. These types of surveys occur in the site assessment phase in order to inform the placement of offshore wind foundations but may also occur intermittently during and after turbine construction to identify, guide, and confirm the locations of turbine foundations. The suite of high-resolution geophysical (HRG) sources that may be used in geophysical surveys includes side-scan sonars (SSS), multibeam echosounders (MBES), magnetometers and gradiometers, parametric sub-bottom profilers, compressed high-intensity radiated pulses (CHIRP) sub-bottom profilers, boomers, and sparkers. Seismic airguns are not expected to be used for offshore wind applications. These HRG sources may be towed behind a ship, mounted on a ship’s hull, or deployed from remotely operated vehicles (ROVs) or autonomous underwater vehicles (AUVs).

Many HRG sources are active acoustic sources, meaning they produce sound deliberately in order to obtain information about the environment. With the exception of some MBES and SSS, they produce sounds below 180 kilohertz (kHz) and thus may be audible to marine species. Source levels vary widely depending on source type and operational power level used, from ~145 dB re 1 µPa-m for towed sub-bottom profilers up to 245 dB re 1 µPa-m for some multibeam echosounders (Crocker and Fratantonio 2016). Generally speaking, sources that emit sound in narrow beams directed at the seafloor are less likely to affect marine species because they ensonify a smaller portion of the water column, thus reducing the likelihood that an animal encounters the sound (Ruppel et al. 2022). While sparkers are omnidirectional, most other HRG sources have narrower beamwidths (e.g., MBES: up to 6°, parametric SBPs: 30°, boomers: 30–90°) (Crocker and Fratantonio 2016). Most HRG sources emit short pulses of sound, with periods of silence in between. This means that only several "pings" emitted from a vessel towing an active acoustic source would reach an animal below, even if the animal was stationary (Ruppel et al. 2022). HRG surveys may occur throughout the construction area with the potential for greater effort in some areas.

Geotechnical surveys may use vibracores, jet probes, bottom-grab samplers, deep borings, or other methods to obtain samples of sediments at each potential turbine location and along the cable route. For most of these methods, source levels have not been measured, but it is generally assumed that low-frequency, low-level noise will be introduced as a byproduct of these actions. It is likely that the sound of the vessel will exceed that generated by the geotechnical method itself.

The potential impacts of geophysical and geotechnical surveys during construction activities on marine mammals and sea turtles are analyzed in Chapter 3, *Affected Environment and Environmental Consequences,* of the Programmatic Environmental Impact Statement (PEIS).

J.3.2 Unexploded Ordnance Detonations

Unexploded Ordnances (UXOs) may be discovered on the seabed in offshore wind lease areas or along export cable routes. While non-explosive methods may be employed to lift and move these objects, some may need to be detonated. Underwater explosions of this type create a shock wave with a nearly instantaneous rise in pressure, followed by a series of symmetrical bubble pulses. Shock waves are supersonic, so they travel faster than the speed of sound. The explosive sound field is extremely complex, especially in shallow waters. In 2015, (von Benda-Beckmann et al.) measured received levels of explosions in shallow waters at distances ranging from 100 to 2,000 m from the source, in water depths ranging from 6 to 22 m. The measured SEL from the explosive removal of a 263 kilogram (kg) charge was 216 dB re 1 $\mu Pa^2 s$ at a distance of 100 m and 196 dB re 1 $\mu Pa^2 s$ at 2,000 m. They found that SELs were lower near the surface than near the seafloor or in the middle of the water column, suggesting that if an animal is near the surface, the effects may be less damaging. Most of the acoustic energy for underwater explosions is below 1,000 hertz (Hz). The potential impacts of UXO detonations on marine mammals and sea turtles are analyzed in PEIS Chapter 3.

As an alternative to traditional detonation, a newer method called deflagration allows for the controlled burning of underwater ammunition. Typically, an ROV uses a small, targeted charge to initiate rapid burning of the ordnance; once this process is complete, the remaining debris can be cleared away. Recent work has demonstrated that both L_{pk} and SEL measured from deflagration events may be as much as 20 dB lower than equivalently sized high-order detonations (Robinson et al. 2020).

J.3.3 Construction and Installation

J.3.3.1 Impact and Vibratory Pile-Driving

At present, the installation of turbine foundations is largely done using pile-driving. There are several techniques, including impact and vibratory driving, and many pile designs and sizes, including monopile and jacket foundations. Impact pile-driving employs a hammer to strike the pile head and force the pile into the sediment with a typical hammer strike rate of approximately 30 to 50 strikes/minute (sm). Typically, force is applied over a period of less than 20 sm, but the pile can generate sound for upwards of 0.5 s. Pile-driving noise is characterized as impulsive because of its high peak pressure, short duration, and rapid onset time. Underwater sound levels generated during pile-driving depend on many factors including the pile material and size, characteristics of the substrate, penetration of the pile in the seabed, hammer energy and size, and water depth. Currently the design envelope for most offshore wind turbine installations anticipates hammer energy between 2,500 and 4,000 kilojoules (kJs), but generally speaking, with increasing pile diameter, greater hammer energy is used. The propagation of pile-driving sounds depends on factors such as the sound speed in the water column (influenced by temperature, salinity, and depth), the bathymetry, and the composition of sediments in the seabed, and will therefore vary among sites. Due to variation in these features, sounds may not radiate symmetrically outward from a pile.

Thus far, there are only a few measurements from construction of offshore wind turbines in United States waters. Two monopiles (7.8-m diameter) were installed off the coast of Virginia (27-m water depth) in 2020. Dominion Energy (2020) recorded sounds during this process; without noise mitigation, L_{pk} source levels were back-calculated to be 221 dB re 1 µPa-m, but with a double bubble curtain, L_{pk} source levels were around 212 dB re 1 µPa-m. The unmitigated SPL source level was 213 dB re 1 µPa-m; the mitigated SPL source level was 204 dB re 1 µPa-m.

Jacket foundations are also common, if not for the main turbine structures, for other structures associated with the wind farm such as the offshore substations (OSS). Jacket foundations are installed using pin piles, which are generally significantly smaller than monopiles, on the order of 2 to 5 m in diameter, but more pin piles are needed per foundation. The sound levels generated will vary depending on the pile material, size, substrate, hammer energy, and water depth.

At the Block Island Wind Farm (BIWF), Amaral et al. (2018a) measured sound levels at various distances during pile-driving of jacket foundations (50 -inch pile diameter, 30-m water depth). It should be noted that the piles were installed at an angle (from vertical), which influenced the directionality of the noise produced, so caution is encouraged with interpretation. Nonetheless, the authors reported SPL received levels between 150 and 160 dB re 1 µPa at approximately 750 m from the piles. The maximum single strike SEL measured at 750 m from the jacket foundations at BIWF ranged from 160–168 dB re 1 µPa^{2}s, nearly 10 dB lower than at Coastal Virginia Offshore Wind (CVOW) (OCS-A 0497). Using measurements combined with acoustic modeling, the peak-peak source levels for pile-driving at BIWF were estimated to be between 233 and 245 dB re 1 µPa-m (Amaral et al. 2018b).

The potential impacts of impact pile-driving on marine mammals and sea turtles are analyzed in PEIS Chapter 3.

Vibratory hammers may be used as an alternative to impact pile-driving. The vibratory hammer continuously exerts vertical vibrations into the pile, which causes the sediment surrounding the pile to liquefy, allowing the pile to penetrate the substrate. The vibratory hammer typically oscillates at a frequency of 20 to 40 Hz (Matuschek and Betke 2009) and produces most of its acoustic energy below 2 kHz. Buehler et al. (2015) measured sound levels at 10-m distance from a 72-inch steel pile, and found them to be 185 dB re 1 µPa, but this is significantly smaller than the sizes expected for offshore wind. While no measurements of vibratory piling for large monopiles have been conducted, modeling predictions from South Coast Wind (OCS-A 0521), for example, estimate that SPL received levels could exceed the behavioral harassment threshold for marine mammals (120 dB re 1 µPa) at distances > 40 kilometers (km) for a 16-m-diameter monopile (LGL Ecological Research Associates 2022). Vibratory pile-driving is a non-impulsive sound source and the hammer produces sound continuously, so different criteria are used for assessing behavioral and physiological effects on marine mammals.

The potential impacts of vibratory pile-driving on marine mammals and sea turtles are analyzed in PEIS Chapter 3.

A technique that is quickly gaining use for installation in hard rock substrates is down-the-hole (DTH) pile-driving, which uses a combination of percussive and drilling mechanisms, with a hammer acting directly on the rock to advance a hole into the rock, and also advance the pile into that hole (Guan et al. 2022). Noise characteristics for DTH pile-driving include both impulsive and non-impulsive components. The impulsive component of DTH pile-driving is the result of a percussive hammer striking the bedrock, while the non-impulsive component is from drilling and air-lifting of cuttings and debris from the pile. While only limited studies have been conducted on DTH pile-driving noise, its characteristics strongly resemble those of impact pile-driving, but with a higher hammer striking rate (approximately 10 to 15 Hz). The dominant frequencies from DTH pile-driving are below 2 kHz, similar to conventional impact pile-driving. Due to the high rate of hammer striking, along with the sounds of drilling and debris clearing out, sound levels in between the pulses are much higher than conventional impact pile-driving (Guan et al. 2022).

Various noise abatement technologies, such as bubble curtains, arrays of enclosed air resonators, or segmented nets of rubber or foam, may be employed to reduce noise from impact pile-driving. Measurements from European wind farms have shown that a single noise abatement system can reduce broadband sound levels by 10–15 dB, while using two systems together can reduce sound levels as much as 20 dB (Bellmann et al. 2020). Based on RODEO measurements from CVOW (OCS-A 0497), double Big Bubble Curtains (dBBC) are shown to be most effective for frequencies above 200 Hz, and greater noise reduction was seen in measurements taken in the middle of the water column compared to those near the seabed. Approximate sound level reduction is 3 to 5 dB below 200 Hz, and 8 to 20 dB above 200 Hz, depending on the characteristics of the bubble curtain (Amaral et al. 2020).

J.3.4 Drilling

Drilling associated with offshore wind activities may involve geotechnical surveys, HDD at the export cable landfalls, and, if necessary, removing large boulders at the site of foundation installation. Sounds from drilling are generally considered to be non-impulsive and are nearly continuous in nature, though they may be highly variable depending on the type of substrate that is encountered (Richardson et al. 1995). There could be tonal sound generated by the drill bit, mechanical noise transferred through the ship's hull, and noise from the vessels and dynamic positioning systems. HDD uses equipment that is generally located on shore, and the sound that propagates into the water is expected to be negligible. Geotechnical drilling SPLs (in the 30–2000 Hz band) have been measured up to 145 dB re 1 µPa-m from a jack-up platform (Erbe and McPherson 2017), and up to 162 dB re 1 µPa-m from an anchored drilling vessel (Huang et al. 2023). If drilling is required for foundation installation, a large drill bit at the bottom of the pile would slowly rotate to break up the material inside the pile, and the liquefied material would be pumped out. While measurements of these operations specifically for offshore wind installation have not been conducted, the closest proxy is from oil and gas-related operations, where a 6-m-diameter drill bit was used for the excavation of mudline cellars (Austin et al. 2018). Austin et al. (2018) measured received levels at 1,000 m from the operations and back-calculated the SPL source levels to be between 191 and 193 dB re 1 µPa-m.

J.3.4.1 Vessels

During construction, vessels and aircraft may be used to transport crew and equipment. See Section J.3.5, *Operations and Maintenance,* for further detail about sounds related to those activities. Large vessels will also be used during the construction phase to conduct pile-driving, and may use Dynamic Positioning (DP) systems. DP is the process by which a vessel holds station over a specific seafloor location for some time period using input from gyrocompasses, motion sensors, Global Positioning Systems (GPS), active acoustic positioning systems, and wind sensors to determine relative movement and environmental forces at work. Generally speaking, most acoustic energy is <1,000 Hz, often below 50 Hz, with tones related to engine and propeller size and type. The sound can also vary directionally, and this directionality is much more pronounced at higher frequencies. Because this is a dynamic operation, the sound levels produced will vary based on the specific operation, DP system used (e.g., jet or propeller rotation, versus a rudder or steering mechanism), and factors such as the blade rate and cavitation, in some cases. Representative sound field measurements from the use of DP are difficult to obtain because the sound transmitted is often highly directional and context specific. The direction of sound propagation may change as different DP needs requiring different configurations are applied.

Many studies have found that the measured sound levels of DP alone are, counterintuitively, higher than those of DP combined with the intended activities such as drilling (Jiménez-Arranz et al. 2020; Kyhn et al. 2011; Nedwell and Edwards 2004) and coring (Warner and McCrodan 2011). Nedwell and Edwards (2004) reported that DP thrusters of the semi-submersible drill rig *Jack Bates* produced periodic noise (corresponding to the rate of the thruster blades) with most energy between 3 and 30 Hz. The received SPL measured at 100 m from the vessel was 188 dB re 1 µPa. Warner (2011) found that most DP-related sounds from the self-propelled drill ship, R/V *Fugro Synergy* were in the 110 to 140 Hz range, with an estimated source level of 169 dB re 1 µPa-m. Sounds in this frequency range varied by 12 dB during DP, while the broadband levels, which also included diesel generators and other equipment sounds, varied by only 5 dB over the same time period. All of the above sources report high variability in levels with time. This is due in part to the intermittent usage and relatively slow rotation rates of thrusters used in DP. It is also difficult to provide a realistic range of source levels from the data thus far because most reports do not identify the direction from which sound was measured relative to the vessel, and DP thrusters are highly directional systems.

The active acoustic positioning systems used in DP can be additional sources of high frequency sound. These systems usually consist of a transducer mounted through the vessel's hull and one or more transponders affixed to the seabed. The Kongsberg High Precision Acoustic Positioning (HiPAP) system produces pings in the 10 to 32 kHz frequency range. The hull-mounted transducers have source levels of 188 to 206 dB re 1 µPa-m depending on adjustable power settings (Kongsberg Maritime AS 2013). The fixed transponders have maximum source levels of 186 to 206 dB re 1 µPa-m depending on model and beam width settings from 15 to 90° (Jiminez-Arranz et al. 2020). These systems have high source levels, but beyond 2 km, they are generally quieter than other sound components from DP vessels for various reasons including: their pulses are produced in narrowly directed beams, each individual pulse is very short, and their high frequency content leads to faster attenuation. The potential impacts of vessel noise on marine mammals and sea turtles are analyzed in PEIS Chapter 3.

J.3.4.2 Site Preparation

Prior to offshore wind project foundation and export cable installation, boulder clearance and pre-lay grapnel runs may be conducted to clear the area of obstructions. This may involve the use of a displacement plow, a subsea grab or, in shallower waters, a backhoe dredger. Sandwave clearance may also be conducted in advance of export cable installation to remove mobile sediments using a suction hopper dredger, controlled flow excavation, or plow. At landfall locations, export cables may be installed using HDD, which may require mechanical dredging of the HDD exit pit.

Sounds from site preparation activities are considered non-impulsive and are nearly continuous in nature. Dredging produces distinct sounds during each specific phase of operation: excavation, transport, and placement of dredged material (Central Dredging Association 2011; Jiminez-Arranz et al. 2020). Engines, pumps, and support vessels used throughout all phases may introduce low-level, continuous noise into the marine environment. The sounds produced during excavation vary depending on the sediment type—the denser and more consolidated the sediment is, the more force the dredger needs to impart, and the higher sound levels that are produced (Robinson et al. 2011a). Sounds from mechanical dredges occur in intervals as the dredge lowers a bucket, digs, and raises the bucket with a winch. During the sediment transport phase, many factors—including the load capacity, draft, and speed of the vessel—influence the sound levels that are produced (Reine et al. 2014). SPL source levels during backhoe dredge operations range from 163 to 179 dB re 1 µPa-m (Nedwell et al. 2008; Reine et al. 2012). As a whole, dredging activities generally produce low-frequency sounds, with most energy below 1,000 Hz and frequency peaks typically occurring between 150 and 300 Hz (McQueen et al. 2018).

Additional detail and measurements of dredging sounds can be found in Jiminez-Arranz et al. (2020), McQueen et al. (2018), and Robinson et al. (2011a).

The potential impacts of site preparation activities on marine mammals and sea turtles are analyzed in PEIS Chapter 3.

J.3.4.3 Trenching and Cable-Laying

The installation of cables can be done by towing a tool behind the installation vessel to simultaneously open the seabed and lay the cable, or by laying the cable and following with a tool to embed the cable. Possible installation methods for these options include jetting, vertical injection, control flow excavation, trenching, and plowing. Burial depth of the cables is typically 1–2 m. Cable installation vessels may use utilize dynamic positioning to lay the cables, which can introduce considerable levels of noise into the marine environment (see Section J.3.4.1, *Vessels*).

Nedwell and Edwards (2004) measured sounds from a 130-m-long trenching vessel and found that sound levels were similar to those produced during pipeline-laying in the same area, with the exception of a 20 kHz tonal sound, which they attributed to the vessel's DP thrusters. Nedwell et al. (2003) recorded underwater sound 160 m away from trenching activity (water depth 7–11 m) and back-calculated the SPL source level of trenching to be 178 dB re 1 µPa-m (assuming propagation loss of 22logR). They described the sound as generally spanning a wide range of frequencies, variable over time, and accompanied by some tonal machinery noise and transient noises associated with rock breakage.

Johansson and Andersson (2012) recorded underwater noise levels during both pipelaying and trenching. The mean SPL measured (at 1,500 m from the pipeline) during pipelay operations was 130.5 dB re 1 µPa, nearly 20 dB higher than average background noise at the same location. There were eight support vessels in the vicinity during pipelaying operations. During trenching, with only one vessel in the vicinity, received levels were 126 dB re 1 µPa, and the authors back-calculated the SPL source level to be 183.5 dB re 1 µPa, similar to that of commercial vessels in the region.

J.3.5 Operations and Maintenance

J.3.5.1 Aircraft

Staffed aircraft consist of propeller and jet engines, fixed-wing craft, as well as helicopters. Unmanned systems also exist. For jet engine aircraft, the engine is the primary source of sound. For propeller driven aircraft and helicopters, the propellers and rotors also produce noise. Aircraft generally produce low-frequency sound below 500 Hz (Richardson et al. 1995). While aircraft noise can be substantial in air, penetration of aircraft noise into the water is limited because much of the noise is reflected off the water's surface (Richardson et al. 1995). The noise that penetrates into the water column does this via a critical incident angle or cone. With an idealized flat sea surface, the maximum critical incident angle is ~13 degrees (Urick 1983); beyond this, sound is reflected off the surface. When the sea surface is not flat, there may be some additional penetration into the water column in areas outside of this 13-degree cone. Nonetheless, the extent of noise from passing aircraft is more localized in water than it is in air.

Jiménez-Arranz et al. (2020) reviewed Richardson et al.'s (1995) sound measurements recorded below passing aircraft of various models. These SPL measurements included 124 dB re 1 µPa (dominant frequencies between 56 and 80 Hz) from a maritime patrol aircraft with an altitude of 76 m, 109 dB re 1 µPa (dominant frequency content below 22 Hz) from a utility helicopter with an altitude of 152 m, and 107 dB re 1 µPa (tonal, 82 Hz) from a turbo propeller with an altitude of 457 m. Recent published levels associated with unmanned aircraft (Christiansen et al. 2016; Erbe et al. 2017) indicate source levels around or below 100 dB re 1 µPa-m. The potential impacts of aircraft noise on marine mammals and sea turtles are analyzed in PEIS Chapter 3.

J.3.5.2 Vessels in Transit

During operations, small vessels may be used to transport crew and supplies. Noise from vessel transit is considered to be continuous, with a combination of broadband and tonal sounds (Richardson et al. 1995; Ross 1976). Transiting vessels generate continuous sound from their engines, propeller cavitation, onboard machinery, and hydrodynamics of water flows (Ross 1976). The actual radiated sound depends on several factors, including the type of machinery on the ship, the material conditions of the hull, how recently the hull has been cleaned, interactions with the sea surface, and shielding from the hull, which reduces sound levels in front of the ship.

In general, vessel noise increases with ship size, power, speed, propeller blade size, number of blades, and rotations per minute. Source levels for large container ships can range from 177 to 188 dB re 1 µPa-m (McKenna et al. 2013) with most energy below 1 kHz. Smaller vessels typically produce higher-frequency sound concentrated in the 1 to 5 kHz range. Kipple and Gabriele (2003) measured underwater sound from vessels ranging from 14 to 65 feet long (25 to 420 horsepower) and back-calculated source levels to be 157 to 181 dB re 1 µPa-m. Similar levels are reported by Jiménez-Arranz et al. (2020), who provide a review of measurements for support and crew vessels, tugs, rigid hull inflatable boats, icebreakers, cargo ships, oil tankers, and more.

During transit to and from shore bases, survey vessels typically travel at speeds that optimize efficiency, except in areas where transit speed is restricted. The vessel strike speed restrictions that are in place along the Atlantic OCS are expected to offer a secondary benefit of underwater noise reduction. For example, recordings from a speed reduction program in the Port of Vancouver (210- to 250-m water depths) showed that reducing speeds to 11 knots reduced vessel source levels by 5.9 to 11.5 dB, depending on the vessel type (MacGillivray et al. 2019). Vessel noise is also expected to be lower during geophysical and geotechnical surveys, as they typically travel around 5 knots when towing instruments. The potential impacts of vessel noise on marine mammals and sea turtles are analyzed in PEIS Chapter 3.

J.3.5.3 Turbine Operations

Once wind farms are operational, low-level sounds are generated by each wind turbine generator (WTG), but sound levels are much lower than during construction. This type of sound is considered to be continuous, omnidirectional radially from the pile, and non-impulsive. Most of the energy associated with operations is below 120 Hz. Sound levels from wind turbine operations are likely to increase somewhat with increasing generator size and power ratings, as well as with wind speeds. Recordings from BIWF indicated that there was a correlation between underwater sound levels and increasing wind speed, but this was not clearly influenced by turbine machinery; rather it may have been explained by the natural effects that wind and sea state have on underwater sound levels (Elliott et al. 2019; Urick 1983).

A recent compilation (Tougaard et al. 2020) of operational noise from several wind farms, with turbines up to 6.15 megawatts (MW) in size, showed that operational noise generally attenuates rapidly with distance from the turbines, falling to near ambient sound levels within ~1 km from the source; the combined noise levels from multiple turbines is lower or comparable to that generated by a small cargo ship. Tougaard et al. (2020) developed a formula predicting a 13.6 dB increase for every 10-fold increase in WTG power rating. This means that operational noise could be expected to increase by 13.6 dB when increasing in size from a 0.5 MW turbine to a 5 MW one, or from 1 MW to 10 MW. The least squares fit of that dataset would predict that the SPL measured 100 m from a hypothetical 15 MW turbine in operation in 10 m/s (19 kilotons [kt] or 22 miles per hour [mph]) wind would be 125 dB re 1 µPa. However, all of the 46 data points in that dataset, with the exception of the two from BIWF, were from WTGs operated with gear boxes of various designs rather than the newer use of direct drive technology, which is expected to lower underwater noise levels significantly. Stöber and Thomsen (2021) make predictions for source levels of 10 MW turbines based on a linear extrapolation of maximum received levels from WTGs with ratings up to 6.15 MW. The linear fit is likely inappropriate, and the resulting predictions may be exaggerated. Tougaard et al. (2020) point out that received level differences among different pile types could be confounded by differences in water depth and turbine size. In any case, additional data is needed to fully understand the effects of size, foundation type properties (e.g., structural rigidity and strength), and drive type on the amount of sound produced during turbine operation. The potential impacts of operational turbine noise on marine mammals and sea turtles are analyzed in PEIS Chapter 3.

J.3.6 Decommissioning

The methods that may be used for decommissioning are not well understood at this time. It is possible that explosives may be used (see Section J.3.2, *Unexploded Ordnance Detonations*). However, given the general trend of reducing the use of underwater explosives that has been observed in the oil and gas industry, it is likely that offshore wind structures will instead be removed by cutting. While it is difficult to extrapolate directly, some insights can be gleaned from a recent study that measured received sound levels during the mechanical cutting of well conductor casings on oil and gas platforms in California. The cutters operated at 60 to 72 revolutions per minute (RPM), and the cutting time varied widely between cuts (on the order of minutes to hours). At distances of 106 to 117 m from the cutting, received SPLs were 120 to 130 dB re 1 µPa, with most acoustic energy falling between 20 and 2000 Hz (Fowler et al. 2022). This type of sound is considered to be non-impulsive and intermittent (i.e., continuous while cuts are actually being made, with quieter periods between cuts). Additional noise from vessels (see Section J.3.4.1, *Vessels*) and other machinery may also be introduced throughout the decommissioning process.

J.4 Acoustic Assessment

Chapter 3 of the PEIS provides a high-level qualitative assessment of impacts of sound on marine life based on the information available related to the New York (NY) Bight alternatives and the mitigations contained within these alternatives. This section supplements the Chapter 3 findings by providing more detail on potential acoustic impacts and uses a relativistic risk assessment framework to discuss tradeoffs to marine mammals associated with the alternatives and select avoidance, minimization, mitigation, and monitoring (AMMM) measures under consideration.

Over the last decade, Bureau of Ocean Energy Management (BOEM) has funded the development of a risk assessment framework that can be used to assess the relative risk to marine mammals of acoustic disturbances associated with different development scenarios. This relativistic risk assessment framework is the foundation for the analyses in this section. The framework was most recently used for oil and gas activity in the Gulf of Mexico (Southall et al. 2021a) and for potential offshore wind development in New England waters (Southall et al. 2021b). The framework identifies risk to marine mammals based on the exposure, or the spatio-temporal-spectral overlap of noise-generating activities with the marine mammals, and considers numerous contextual variables that define the vulnerability of a species to acoustic disturbances. The framework has been effective in comparing the *relative risk* of different development scenarios and the *relative risk* of each scenario between species.

Due to the programmatic nature of this PEIS and the long lead times in the regulatory process, many details needed to fully complete the risk assessment framework for the NY Bight projects are still unknown. Therefore, this assessment draws on thematical findings from a completed hypothetical case study (Southall et al. 2021b) that analyzes the development of two wind farms off New England and serves as the best available proxy for the NY Bight analysis at this time.

Using this case study, the analysis to follow focuses on tradeoffs associated with NY Bight alternatives and associated mitigation measures being considered in the PEIS to lessen the extent of acoustic disturbance on marine mammals associated with pile-driving and, to a lesser extent, vessel noise. This analysis is done through assessing the potential changes in exposure risk of marine mammals to noise with the implementation of different AMMM measures. The vulnerability of a species is also an important factor in assessing the overall risk of offshore wind development on marine life, but this factor cannot be directly controlled for in this analysis and therefore is not analyzed further.

The use of this framework does not replace sound field modeling and other standard numeric modeling exercises at the project level, which are needed for specific purposes such as informing take estimates and mitigation zones.

J.4.1 NY Bight Alternatives

The EIS analyzes three alternatives:

- **Alternative A (No Action Alternative):** No development would occur on any of the six NY Bight lease areas. There would be no acoustic impacts associated with the development of the six NY Bight lease areas under Alternative A. This alternative is not discussed further in this assessment. However, note that Section 3.5.6.3 of the PEIS still discusses noise impacts on marine mammals associated with the No Action Alternative that exist regardless of the presence of any NY Bight project development.

- **Alternative B:** Defers adoption of the AMMM measures to NY Bight project-level reviews (and thus no programmatic mitigation measures are identified).
- **Alternative C:** Adopts AMMM measures at the programmatic level and identifies others deferred to the project-specific level.

Alternatives B and C analyze impacts at both a single project level and across all six proposed projects. The acoustic impacts associated with the development of the six NY Bight lease areas under Alternative B and C will be discussed, to the extent possible, in sections later in this document.

J.4.2 Overview of Relativistic Risk Assessment Framework

A team of experts recently developed the newest iteration of their acoustic risk assessment framework for marine mammals (Wood et al. 2012); the most recent framework considers aggregate acoustic exposures from the construction and operation of multiple wind farms (Southall et al. 2021b, 2023). The framework was intentionally designed to be tunable to allow users to assess specific scenarios based on the temporal, spatial, and spectral overlap of noise-generating activities and marine species. Their case study for offshore wind development in New England (Southall et al. 2021b, 2023) provides a useful analog to the potential development in the NY Bight and is used here to consider the relative risks posed by the alternatives and associated mitigations considered in the PEIS.

This framework is based on an exposure index (representing the probability of exposure of a species to an activity) and the vulnerability index (representing the inherent vulnerability of a given species to anthropogenic disturbance) (Figure J-3). The resultant risk value is calculated for each species and each month of a specified scenario, providing high-level insights about the spatio-temporal-spectral interactions and risk trade-offs associated with different development scenarios.

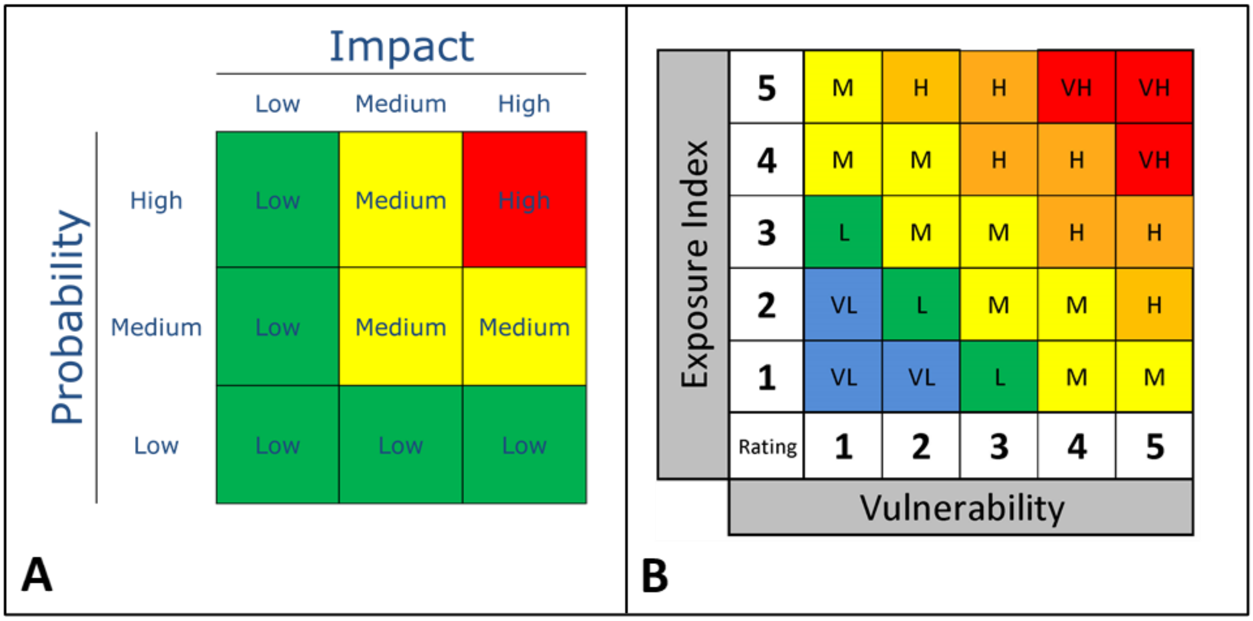

Figure J-3. Generic risk assessment matrix (left) and risk assessment matrix from Southall et al. (2021b, 2023) (right)

A. Example risk assessment matrix.
B. Risk assessment matrix from Southall et al. (2021b, 2023). The exposure index reflects the spatial, spectral, and temporal overlap of the noise event and the species at hand, and the vulnerability axis reflects species-specific contextual factors.

J.4.2.1 Exposure Index

The exposure index aims to quantify the "severity" of a given noise event by considering the spatio-temporal extent of a noise-generating activity and its overlap with the spatio-temporal presence of a species. The spatial component of the exposure index is based on the area within which a behavioral response is likely to occur (but can be tuned to reflect any type of response, ranging from auditory detection to auditory injury). The temporal component considers the proportion of a population present at a given time in the spatial area that is exposed, in comparison to the overall population present over a larger geographic zone or region at the same time. The spectral content of the noise source is considered to focus on the portion of the noise that actually overlaps with the hearing range of each marine mammal hearing group (Southall et al. 2007). The exposure index is calculated separately for each wind farm, month, and species combination. An aggregate exposure index also can be calculated for an individual species for a defined project development scenario by summing the monthly exposure index values across a year. This value is normalized by the number of animals in the geographical zone (or local population as may be referred to here) to obtain a percentage, such that the aggregate exposure index percentage represents the portion of the population that would be exposed.

J.4.2.2 Vulnerability Index

The vulnerability index aims to quantify the baseline vulnerability of a given population. Therefore, it is species-specific, and includes the following factors: (1) the spatio-temporal presence of the species in the activity area, (2) the species' ecological use of the activity area and environmental risk factors of the specific area considered, (3) the hearing capabilities of the species, and (4) the general trends in the size and health of the population. As these factors may change over time, these are evaluated at a monthly resolution to capture the temporal variation in vulnerability associated with these factors.

J.4.2.3 Final Risk Score

The final integrated risk score for a species is assessed by intersecting the exposure index and vulnerability index on a five by five matrix (which is skewed toward the exposure index), depicting the relative risk with a color bar reflecting highest, higher, moderate, lower, and lowest risk. Because the parameters of both the exposure index and vulnerability index are specified for each development scenario of interest, a separate risk matrix will be obtained for each specific geographic area, species, and activities considered and should only be used to assess *relative* risk within the scenarios analyzed. This analysis should not be considered a measure of absolute risk.

J.4.2.4 What the Framework Is and Is Not

Due to the broad temporal and spatial resolution of this framework in its current form, it cannot be used to evaluate specific interactions between individual animals and individual noise-generating events. The framework provides a broader view of the effect of larger-scale or longer-term projects on a given population and gives insight about *relative* risk of the multiple scenarios under consideration and the *relative* risk posed to each species. In its current form, the framework makes no attempt to differentiate between the types of effects (i.e., injury, behavior, or masking) because acoustic disturbance is considered more generally as an exposure term; however, the exposure term could later be tuned to consider specific types of effects. This framework also does not include noise propagation modeling, individual animal movement, or energetic model assumptions; these factors will be considered at the project level.

J.4.3 Overview of Hypothetical New England Wind Farm Case Study

The acoustic risk assessment framework was most recently used to explore the trade-offs associated with hypothetical wind farm development in southern New England waters (Southall et al. 2021b), herein referred to as the "case study." This case study provides a useful analog for offshore wind farm development in the NY Bight due to similarities in geographic location and trends in species occupancy in the area. The case study is being introduced and described here to provide insight about the possible spatio-temporal-spectral factors that should be considered with respect to the alternatives being considered for offshore wind in the NY Bight.

The hypothetical wind farms considered in the case study include two wind farms in southern New England, located ~35 km apart (Figure J-4). This distance was chosen so that the wind farms would be near to each other, but any acoustic impact radii associated with the two wind farms would be expected to be non-overlapping. Although the parameters of these wind farms are realistic, they were not intended to represent a specific project.

- Wind farm 1 (WF1): 25 by 25 km^2 area (150,000 acres), 180 monopiles
- Wind farm 2 (WF2): 10 by 20 km^2 area, (50,000 acres), 60 monopiles

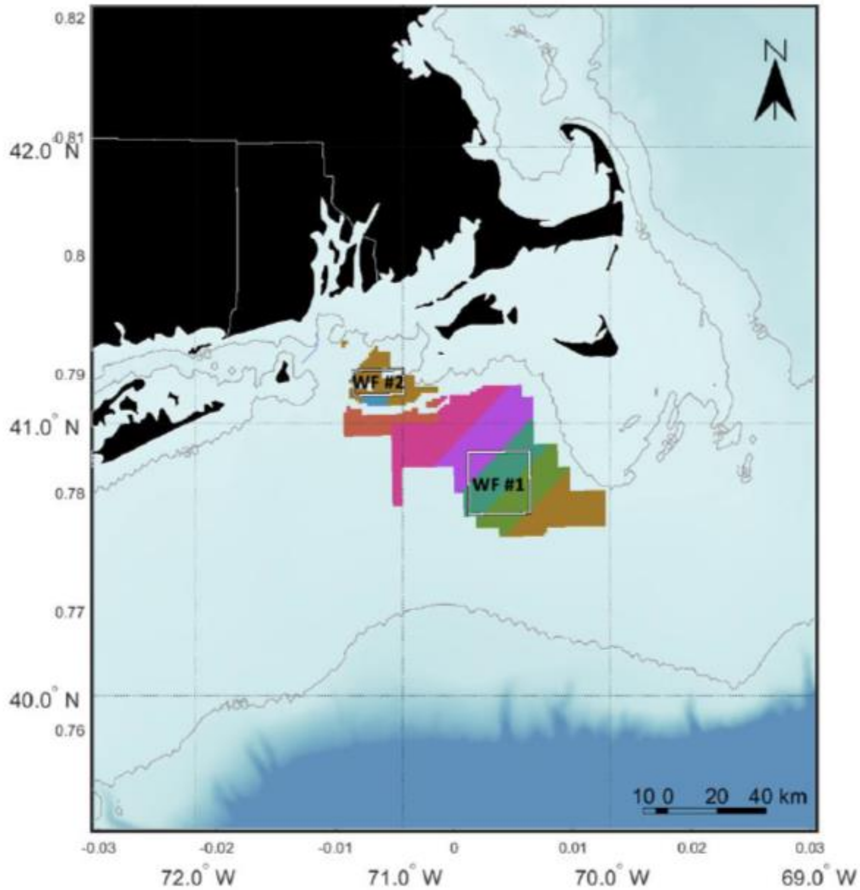

Figure J-4. Hypothetical New England wind farm locations off Massachusetts

Offshore leased areas shown in colored polygons, with two white rectangles outlining the locations of the two wind farms assessed.
Source: Southall et al. (2021b).

The team assessed the relative risk to these focal species for the following reasons:

- **North Atlantic Right Whale (NARW)**: Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA) listed and in the low-frequency hearing group.
- **Humpback whale (humpback)**: not ESA listed but a relatively common whale in the low-frequency hearing group.

- **Common dolphin (dolphin)**: an odontocete in the mid-frequency hearing group; very common in the geographic analysis area.
- **Harbor porpoise (porpoise)**: a less common odontocete but particularly sensitive to noise; represents the high-frequency hearing group.
- **Gray seal (seal)**: represents the phocid pinniped group; increasingly common in the geographic analysis area, although less so in the open ocean of the continental shelf.

For simplicity, these species are referred throughout by the short-hand term listed next to the species name in parentheses in the previous list.

The spatio-temporal presence of these species in the geographical locations of the hypothetical wind farms was obtained from the Roberts et al. (2020)[1] marine mammal density data set. A monthly risk matrix was calculated for each of the five species for a 3-year time span. See Southall et al. (2021b) for complete details of the New England case study and risk assessment process, including components not further discussed here (e.g., masking).

J.4.3.1 Exposure Index Calculations

Year 1

The objective of the Year 1 assessment was to explore the trade-offs associated with construction timing, the duration of pile-driving each day, and the use of mitigation (noise abatement). The following details provide the parameters and assumptions used in calculating the exposure index for all five species in Year 1.

J.4.3.2 Scenarios

- 120 foundations were installed on WF1; pile-driving was the main contributor of noise.
- Option of either unmitigated or mitigated pile-driving (using noise abatement).

J.4.3.3 Spatial Component

- The authors used measurements made during the installation of a 7.8-m monopile with (mitigated) and without (unmitigated) a double bubble curtain during the construction of the Coastal Virginia Offshore Wind Farm (OCS-A 0497) (Ørsted 2020) to calculate the radial distance around each pile at which the received levels to behavioral impact would be exceeded.
    - Harbor porpoise

[1] Although gray seal is the species specified here, the Roberts et al. (2020) data is not specific to that species of seal. This specific species was considered for obtaining information relevant to other components of the vulnerability score.

        - Behavioral disturbance would occur at a received level of 120 dB re 1 µPa; this sound level was exceeded at distances up to:
            - 20 km for the unmitigated scenario.
            - 15 km for the mitigated scenario.
    - Other four marine mammals considered
        - Behavioral disturbance would occur at received levels of 160 dB re 1 µPa; this sound level was exceeded at distances up to:
            - 10 km under the unmitigated scenario.
            - 5 km for the mitigated scenario.

J.4.3.4 Temporal Component

- Three potential construction start dates explored: March 1, May 1, or July 1.
- Option of either one pile driven per day or two piles driven per day:
    - Total duration of pile-driving: 4 months for one pile/day.
    - Total duration of pile-driving: 2 months for two piles/day.

J.4.3.5 Spectral Component

The spectral index is calculated by multiplying the species abundance number by a coefficient that indicates the spectral overlap of the noise and the functional hearing (Southall et al. 2007) of the marine mammal species under consideration. This calculation deemphasizes the exposure (essentially decreasing the number of animals exposed) if the spectral energy in a signal is outside the frequencies that the species hears best. To do this weighting a spectrum of the source signal was needed. For pile-driving, a spectrum from HDR (2020) was used from the pile-driving installation of a 7.8-m monopile measured within 3 km of the monopile.

J.4.3.6 Year 2

The objective in the Year 2 assessment was to explore the relative interactions and cumulative effects associated with installation of more than one wind farm, as well as the trade-offs associated with the timing of installation.

J.4.3.7 Scenarios

- 60 foundations were installed on WF1, and 60 installed on WF2; pile-driving was the main contributor of noise.

- Only considered unmitigated pile-driving and installation of one pile/day.

J.4.3.8 Spatial Component

- Same as Year 1 unmitigated scenarios (20 km for porpoises and 10 km for all other species considered).

J.4.3.9 Spectral Component

- Same as Year 1.

J.4.3.10 Temporal Component

- The analysis explored three installation timing scenarios that affected the temporal component of the exposure index. The scenarios all assumed installation of only one pile/day but varied in the degree of overlap between the two nearby windfarms:
  - *Sequential installation*: WF1 construction July/August, WF2 construction September/October (total of 4 months to install 120 foundations).
  - *Partial overlap*: WF1 construction July and August; WF2 construction August and September (total of 3 months to install 120 foundations).
  - *Total overlap*: WF1 and WF2 construction August and September (total of 2 months to install 120 foundations).

J.4.3.11 Year 3

The objective in the Year 3 assessment was to explore the relative risk associated with the operational phase of offshore wind development. The following assumptions were made for Year 3.

J.4.3.12 Scenario

- Both WF1 and WF2 were fully operational.
- Operational noise from each turbine and vessel noise (defined by vessel type, number of trips, speed, and trip duration) were the main contributors of noise.

J.4.3.13 Spatial Component

- *Operational noise:* The radial distance to the behavioral thresholds for an operating turbine was considered to be 100 m for all species (Tougaard et al. 2020). It is worth noting that the spatial extent of exposure for turbine operations was also a function of the number of operating turbines and thus was twice as large for WF1 than WF2.

- *Vessel noise:* The exposure associated with vessel noise was calculated as a function of vessel speed in the wind farm area (31 km/hour), average length of a vessel trip (4 hours), and the radius of behavioral response, which was assumed to be 0.5 km from a vessel (Holt et al. 2021). These estimates were based on a crew transfer vessel, which is expected to be the most prevalent in the area during operations and maintenance times.

J.4.3.14 Temporal Component

- *Operational noise* was considered to be uniform throughout the year.
- *Vessels* were assumed to make 30.8 trips each month to WF1 and 10.3 trips each month to WF2, with a uniform distribution across the year.

J.4.3.15 Spectral Component

- *Operational turbine:* The authors used a spectrum measured by Ingemansson Technology AB (2003) during wind speeds of 14 m/s, measured within 83 m of the turbine.
- *Vessel noise:* The authors used a spectrum measured by Hermannsen (2014) at 100 m from a vessel transiting at 30 km/hour.

For complete details of the New England case study and risk assessment process, including components not further discussed here (e.g., masking and vulnerability index), see the full report by Southall et al. (2021b). Note: the utility of the risk assessment framework for offshore wind has been summarized in Southall et al. 2023.

J.4.4 Overview of Findings from the New England Case Study

Overall, the New England case study identified several key results and mitigative principles.

J.4.4.1 Results

- The lowest exposure risk associated with pile-driving coincided with times of lowest animal abundance.
- Mitigated pile-driving reduced the overall exposure indices in comparison to unmitigated pile-driving.
- Of the scenarios explored, there was no common strategy for minimizing exposure risk to each species with the installation scenarios explored (i.e., *sequential installation, partial overlap, total overlap*).
- The exposure risk associated with the construction of multiple wind farms is not additive and depends heavily on the spatio-temporal overlap of the animals and the activity. Higher relative

exposure risk is expected when activity overlaps most in time and space with the location of the animals.

- The relative noise exposure risk of offshore wind development on marine mammals is higher for low frequency cetacean (LFC) than mid frequency cetacean and high frequency cetacean due to the low frequency nature of the noises most-commonly generated during offshore wind development (i.e., pile-driving and vessel noise).

J.4.4.2 Mitigative Principles

- A reduction in noise at the source could reduce the spatial extent of potential exposure to all species.
- Focusing activity (pile-driving or vessel activity) to times when animals are not present or are in very low abundance in the area could decrease the risk to marine mammals. As no time exists when no animals are present, the specific trade-offs to certain species would have to be weighed against conservation needs and priorities.
- Increased monitoring could lead to increased opportunities to further mitigate effects on marine mammals.
- For some species, some temporal overlap in construction windows could reduce aggregate impacts, while for other species, it may increase it. During project planning, careful consideration should be given to the spatio-temporal distribution of species of interest with the overlap of the spatio-temporal aspects of development. With an adaptable development timeline, risks to marine mammal species of interest could be reduced.

The details of these results follow. The discussion focuses on results from the one pile/day unmitigated scenario as these parameters were used consistently across Years 1 and 2 in the New England case study. Examples from other scenarios will be used to highlight key points and will be specifically called out. Each species had a different vulnerability index, which is a critical component of the overall risk assessment but is not discussed further here as the primary purpose is to consider the ways that different development scenarios affect the exposure index.

J.4.4.3 Year 1

The difference in the results across the three start time scenarios for a given species was primarily driven by the animal abundance, with the lowest risk occurring when pile-driving coincided with the times of lowest animal abundance. Animal abundance can change drastically over a year for some species (Table J-1). For the NARW and harbor porpoise, the lowest aggregate exposure resulted from a July start, while for humpbacks and seals, it was a May start, and for common dolphins, a March start.

Table J-1. Aggregate exposure index percentages over the course of the year for each construction start time scenario by species for the one pile/day, unmitigated scenarios

Species	March Start	May Start	July Start
NARW	3.1915	2.8316	2.3398
Humpback	1.1440	0.8271	0.8649
Dolphin	0.1747	0.2540	0.4438
Porpoise	1.3046	1.0413	0.8522
Seal	0.7096	0.1470	0.1671

In comparing the one pile/day versus the two piles/day unmitigated scenarios, when pile-driving started in July, the two piles/day scenario posed a lower exposure risk to all species except porpoise (Table J-2). In contrast, when pile-driving started in either March or May, the exposure index was higher for every species (except dolphins) in the two piles/day scenario (Table J-2). *This suggests that pile-driving noise exposure, and consequently the overall risk to the five marine mammal species considered here, can be substantially lowered by concentrating pile-driving efforts when the fewest animals are present in the area.*

Table J-2. Aggregate exposure index percentages for each construction start time scenario by species for the two piles/day, unmitigated scenarios

Species	March Start	May Start	July Start
NARW	4.1906	3.6195	2.0325
Humpback	1.3793	0.9281	0.7206
Dolphin	0.1357	0.2141	0.2965
Porpoise	1.4826	1.1235	0.9537
Seal	0.9322	0.2398	0.1074

However, given that not all species are affected equally due to their different distributions throughout the year, the specific trade-offs to certain species would have to be weighed against conservation needs and priorities, and care is needed when considering the timing of these events. It is important to emphasize that for some species, the risk would increase for two piles/day versus one pile/day if the timing does not coincide with periods of lowest abundance. For example, a March start date with the two piles/day scenario led to higher exposure indices than one pile/day for certain species (NARW, porpoise, seal). That is because these species have higher densities in the geographical area during March than in July. Thus, when animals are more abundant, the exposure index is higher in a two piles/day scenario.

Intuitively, the exposure index was always lower in the mitigated scenarios versus the unmitigated scenarios because the spatial component of the exposure index was smaller. For a reduction in the behavioral impact range from 10 km down to 5 km, the decrease in the resulting exposure index was four-fold, since the area exposed is reduced as a function of r^2. This consistently led to a change in the integrated risk assessment score by at least one step (e.g., lower to lowest) when comparing the mitigated and unmitigated case of the same scenario, although in many cases the risk decreased by multiple steps (e.g., from highest to moderate). *This finding suggests that anything that can be done to reduce the spatial extent of noise exposure will reduce overall risk from noise across species.*

This overall synthesis demonstrates the utility of this framework for identifying the risks and tradeoffs to multiple species associated with different potential development scenarios. It also demonstrates that, with an adaptable development timeline, risks to marine mammals can be reduced.

J.4.4.4 Year 2

The Year 2 analysis considered only the unmitigated one pile/day conditions for the construction of 60 piles at each of two wind farms in either a sequential, partial overlap, or total overlap construction scenario. Based on the Year 1 findings, only the late summer/fall seasons (July–October) were considered for pile-driving as this was the period with the lowest overall risk to the species analyzed.

When comparing the three installation timing scenarios, the lowest aggregate exposure for three of the five species (NARW, dolphin, seal) occurred with the partial overlap scenario, while the sequential construction led to the lowest aggregate exposure for humpback whales and total overlap led to the lowest aggregate exposure for porpoise (Table J-3). *These results suggest that for the scenarios explored in the New England case study, a condensed construction timeline may help to reduce the exposure for marine mammals, but consideration needs to be given with respect to species of interest, their density, and distribution at each of the construction sites for the times when construction is anticipated, as no common reduction was seen across all species by condensing construction. Similar trade-offs would likely exist if additional species were also considered, and in the case of the NY Bight.*

Table J-3. Aggregate exposure index percentages for each construction timeline approach by species

Species	Sequential Construction	Partial Overlap	Total Overlap
NARW	1.8415	1.6665	1.6775
Humpback	2.1419	2.2610	2.3287
Dolphin	0.2592	0.2341	0.3358
Porpoise	0.7455	0.5649	0.5090
Seal	0.3579	0.3327	0.3715

To understand the difference in aggregate exposure of two wind farms near each other being constructed instead of one wind farm, this analysis compared the Year 1, unmitigated, one pile/day, July start scenario with Year 2 sequential installation results. In both scenarios, a total of 120 piles were driven over 4 months. There was no common trend across all species; for some species (i.e., humpbacks and seals), the construction of one wind farm led to lower aggregate exposure, whereas for other species (i.e., NARW, dolphins, and porpoise), the construction of two wind farms led to lower aggregate exposure (Table J-4). The differences across species were driven by small-scale differences in animal densities at WF1 versus WF2, underscoring *the need for careful consideration of the spatio-temporal distribution of species of interest with the overlap of the spatio-temporal aspects of development during planning.*

Table J-4. Aggregate exposure index percentages for Year 1 and Year 2 by species

Species	Year 1	Year 2
NARW	2.3398	1.8415
Humpback	0.8649	2.1419
Dolphin	0.4438	0.2592
Porpoise	0.8522	0.7455
Seal	0.1671	0.3579

Notes: **Year 1**: unmitigated, one pile/day, July start scenario of Year 1 construction of WF1; **Year 2**: unmitigated, one pile/day, Year 2 sequential construction of WF1 and WF2.

These results demonstrate that there are species-specific differences in the magnitude and direction of change in aggregate exposure associated with the development of one versus multiple wind farms, linked to the specific location of the wind farms and construction timing, which interact differently with the unique spatio-temporal distribution of the species. In terms of the NY Bight, this is surely to be the case. For example, one of the NY Bight lease areas is located closer to shore than the other five. As a result, there are clear differences in the density magnitude of certain species there than at the other lease areas, although there are similar seasonal presence trends at all of the NY Bight lease areas. In particular, dolphins are present in lower numbers and seals are present in higher numbers at the more coastal lease area than in comparison to the other lease areas. Because many of the species considered are migratory animals there are also differences that can be expected due to the latitudinal range of a species. Therefore, it seems reasonable to expect different exposure risk across the lease areas. The cumulative exposure associated with the build-out of two or more wind farms simultaneously will depend on the construction timing and wind farm locations. For the NY Bight, if multiple wind farms will be constructed simultaneously (e.g., sequentially, or some degree of overlap), this relative risk framework can be used to identify a construction scenario that reduces aggregate exposure for priority species.

J.4.4.5 Year 3

Both vessel noise (primarily from wind farm maintenance) and turbine operational noise were considered in Year 3. Because the exposure index results were higher for vessel operations than operating turbines, the exposure index results reported were only a function of vessel operations. The authors of the analysis emphasized caution in using the results of the Year 3 analysis as there were no large-scale wind farms in operation in the United States from which to build the necessary assumptions for this part of the case study. Therefore, the case study was informed by the best available, albeit cursory, knowledge of likely vessel use during the operational phase of a wind farm; the assumption is that vessels would primarily be used to transfer crew for maintenance of the turbines.

The case study assumed that vessel use would be uniform across the year, leading to a higher aggregate exposure for several species (NARW, humpback, and gray seals) for the Year 3 scenario compared to the Year 1, July start scenario. The case study demonstrated this result despite generally *lower* exposure risk associated with vessel noise in any given month. Because the aggregate exposure index is calculated by summing across all months with the assumption that there was vessel activity in every month, the aggregate exposure index percentage associated with vessel noise was *higher* than for pile-driving, assumed to occur for only 2 to 4 months of a given year. It is worth noting that exposure risk in this analysis does not specifically mean risk of auditory injury, but rather the potential risk to some noise effect. A uniform distribution was assumed for vessel activity across the year, leading to high aggregate exposure. Similar to restricting pile-driving activity to certain times of the year, *there may be decreased relative risk to marine mammals if maintenance of wind farms could coincide with periods of low marine mammal abundance.* For example, for humpback whales and the NARW, concentrating maintenance activity to the summer and early fall could lead to the lowest relative risk for these species. *Because the seasonality of marine mammals is similar in the NY Bight and New England waters, this potential mitigation could also hold true for the NY Bight.*

Although this analysis focused on vessel noise, the results also are relevant to vessel strike risk. Minimizing the exposure to vessel activity in general could mitigate both vessel noise and vessel strike risk.

J.4.4.6 Final Remarks on New England Case Study

A final observation of this analysis is that there are still limitations in our understanding of where and when animals are present on the OCS, in particular the lack of data on species vulnerability. This gap was particularly the case for seals and harbor porpoise in the area where the scenarios were being considered. *This deficiency may be overcome with increased long-term, continuous, and comprehensive monitoring efforts. Long-term Passive Acoustic Monitoring (PAM) to collect additional information about the presence and distribution of marine mammals is an AMMM measure considered for the NY Bight.*

While considering the results for the New England case study, it is important to keep a few things in mind. These results are provided here to understand how noise exposure might be reduced with different approaches and the trade-offs for each approach. This understanding is the emphasis of this analysis, not the absolute numbers presented from the case study. By staying within the limiting parameters (similar seasonality and overall abundance between the NY Bight and southern New England, for example), valid conclusions can still be extrapolated from even relative results for specific and well-chosen questions.

The results and mitigative principles from the New England case study informed the selection of noise-related AMMM measures and guided the discussion of the acoustic impacts of the alternatives.

J.4.5 Comparison of Southern New England and NY Bight

The United States East Coast can be divided into different ecoregions based on species distributions, ecological processes, geology, oceanography, biology, environmental threats, among other factors (Greene et al. 2010). The NY Bight/southern New England area forms one ecoregion. Relative to the rest of the Atlantic OCS, the NY Bight and southern New England are fairly similar and likely to serve similar ecosystem services. Therefore, the presence, abundance, and ecological use of the NY Bight lease areas by marine mammals is not expected to differ greatly from the area of the hypothetical wind farms in the New England case study, and the case study can be used to make inferences about potential wind farm development in NY Bight.

To confirm that this assumption was reasonable, BOEM used the marine mammal data that informed the case study (Roberts et al. 2020) to compare the densities of marine mammals in the New England case study area to the lease areas under consideration in the PEIS. Since the completion of the case study, however, the marine mammal density data has been updated (Roberts et al. 2016, 2023), so BOEM also compared marine mammal densities between the two areas using the more recent models (Figure J-5). In most cases, the marine mammal densities at the New England locations were similar to or greater than the densities for the NY Bight, which means the results of the case study are somewhat conservative and can potentially serve as an upper bound for potential risk in similar scenarios. However, for common dolphins, the density in the NY Bight was generally higher than New England, so the potential risk identified in the case study is likely an underestimate for this species.

- Harbor porpoise and seal density in the New England case study was generally similar both in magnitude and seasonality to the NY Bight lease areas, though for WF2 the largest peak in seal density was in winter as opposed to in the spring for WF1 and the NY Bight lease areas. The overall trend remained the same: seals were present in high numbers in both locations in the winter and spring and not present, or present in low numbers, in the summer and early fall.
- For the NARW, the seasonality patterns were similar; there were few animals present in summer and fall, but more animals were present in winter and spring. However, the number of animals in the New England wind farms were much higher, suggesting the results from the New England case study should serve as an upper bound for the NARW in the NY Bight.
- For humpback whales, there was a 1-month difference in the timing of the peak humpback density in the fall. This peak occurred in September for New England and October for the NY Bight.
- For common dolphins, the general distribution across the year was similar, but the number of animals in the NY Bight lease areas was higher than in the New England wind farm locations. One outlier in the NY Bight leases was OCS-A 544, the most coastal of the NY Bight leases. This area had lower overall densities across the year than the other NY Bight lease areas and represents a more coastal location than the other lease areas. This trend is similar to the magnitude difference in the New England wind farms, where WF2 (the more coastal site) has lower overall numbers of animals in comparison to WF1. Therefore, the two New England wind farm locations capture the variation seen in common dolphin density between coastal and offshore locations in the NY Bight lease areas.

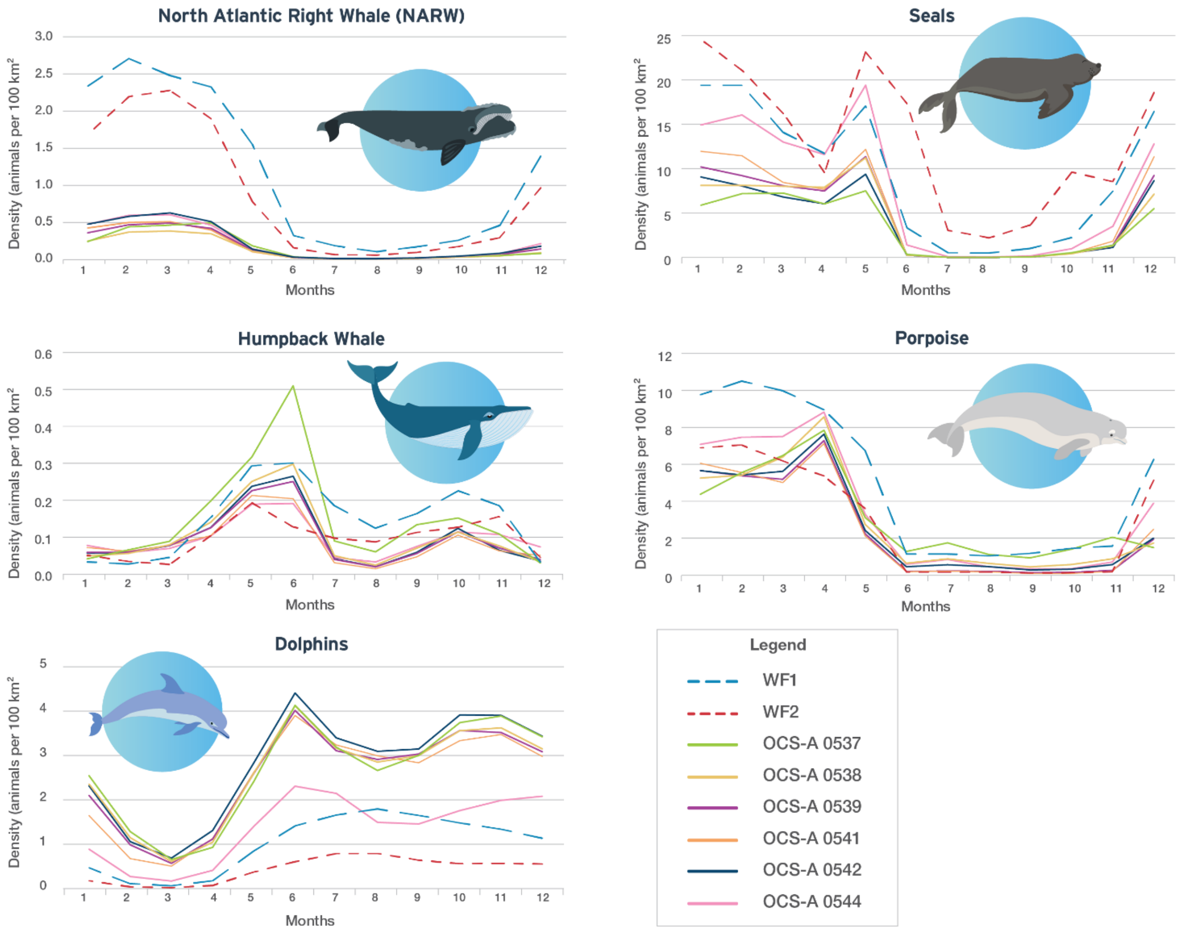

Figure J-5. Comparison of average animal density in the New England hypothetical wind farm areas (WF1 and WF2) with the average animal density in the NY Bight lease areas (OCS-A 0537, 0538, 0539, 0541, 0542, and 0544)

Note: The y-axis scales are different among the plots.
Source: Roberts et al. (2022).

In summary, the density distribution differences identified for each species between the New England wind farms and NY Bight lease areas point to only a few shortcomings in the overall applicability of the New England case study findings to the NY Bight. First, that the densities associated with the common dolphin, particularly those associated with WF1, may be less than for the NY Bight, which could underestimate the risk to common dolphins. However, common dolphins had the lowest assessed risk of any of the species considered in the New England case study, in part, due to their low vulnerability. Second, some species' densities in the NY Bight lease areas exceed those of the hypothetical wind farms at certain times of the year, such as for humpback whales in spring and early summer at OCS-A 0537. However, this difference is acceptable because this programmatic-level assessment considers the general trend in density distribution across the year rather than on a single month resolution.

J.4.6 Discussion of Acoustic Impacts Under Alternative B

Under Alternative B, adoption of AMMM measures would be deferred to NY Bight project-level reviews, and the largest spatio-temporal extent of noise associated with the development of offshore wind in the NY Bight has the potential to be realized. Pile-driving would be expected to be the greatest contributor to potential noise-associated effects on marine mammals.

Under Alternative B, pile-driving would not be excluded in certain time periods, including periods when species of greatest concern such as the NARW could be present, and periods when other species are in high abundance in the area and on the lease site. At the programmatic level, there would not be measures in place to monitor for marine mammals or modify activities should an animal be exposed to impactful levels of sound. Baleen whales and seals would be especially susceptible, as their hearing range overlaps with the low frequency sounds produced during offshore construction activities.

It is difficult to predict the spatio-temporal impact of the project build-outs under Alternative B without an understanding of many of the construction specifics of the NY Bight projects, e.g., construction effort within a day (e.g., number of piles driven in a day), order of construction among the leases, whether construction on one project will overlap in time with one another, and whether construction on a single project will occur all in one year. A few example scenarios using what is known either from the representative project design envelope (RPDE), or what can be built from the New England case study, are provided to help illuminate the subject. These are only illustrations of what could be, and should not be considered as the only possibilities. Until more details are known, these scenarios should only be considered as hypothetical.

J.4.6.1 Build-out of One Project

Marine Mammals Exposed

Year 1 unmitigated results of the New England case study, as previously described, may provide the best available hypothetical example of the relative risk and aggregate exposure associated with the build-out of one project for the NY Bight. However, some limitations should be considered. The case study considered construction of 120 foundations in 1 year, and more construction activity would increase the chance of exposure.

Exposure Time

Based on the RPDE, a maximum of 280 foundations is anticipated for a single wind farm in the NY Bight. If pile-driving takes 4 hours per pile and one pile is driven per day, then 16.66% of a 24-hour period would have pile-driving noise occurring. If the rate increases to two piles/day, the time of pile-driving noise increases to 33.33%. It would take a minimum of 9.33 months to install 280 foundations in a one pile/day scenario, or 4.67 months with two piles/day. (As a reminder, in the case study it took 4 months or 2 months, respectively, to drive 120 piles). In either scenario, or with more piles driven per day for the same total number of foundations, construction noise would occur for 12.78% of the year. The difference is in the amount of “quiet time” per day at or near the pile-driving location, which could be an important factor for animals in the vicinity (i.e., recovery of fatigued auditory systems, offering a break from masking, etc.). If construction occurred continuously in a single year, under a one pile/day scenario, construction during periods when more animals are in the area would be unavoidable for many species, as no seasonal restrictions would be in place at the programmatic level under Alternative B.

Exposure Area

The spatial extent of behaviorally impactful noise levels under Alternative B during a single pile-driving event is anticipated to be of a similar order of magnitude as the unmitigated scenarios in the New England case study, unless mitigation were to be conducted at the project level. The unmitigated pile-driving scenario considered in Southall et al. (2021b) predicted potential effects on marine mammal behavior within 10 km of the foundation being installed. This radius would represent a potential exposure area of 314 km^2 (180% the smallest NY Bight lease area, i.e., 174 km^2; or ~62% of the largest NY Bight lease area, i.e., 510 km^2). Overlapping sound fields would not occur as a result of pile-driving in the build-out of one wind farm unless multiple pile-driving events were conducted at the same time.

J.4.6.2 Build-out of Six Projects

Because so many of the construction details are unknown at the time of this programmatic acoustic assessment, there are countless ways in which six projects could be built out, and it is difficult to predict what the effect of simultaneous build-out of six wind farms would look like. As shown in the New England case study, the aggregate marine mammal exposure associated with the build-out of one wind farm versus build-out of two *was not additive* and was dependent on the site-specific density patterns of a species at the time of construction. However, BOEM does assume that the spatio-temporal exposure would be greater for six wind farms than one and would vary by species. Though the use of the relativistic risk assessment framework would be deferred at the programmatic level under Alternative B, it could be used at the project level to predict the relative exposure risk to the marine mammal species of interest by considering the species density and distribution at the construction sites at the time of year planned for construction.

The simultaneous build-out of six wind farms has the potential, albeit unlikely, for overlapping sound fields if concurrent pile-driving is pursued at two close proximity sites. It is not likely that the isopleths associated with injury or behavioral effects (NMFS 2022) associated with construction on lease areas OCS-A 0544 and OCS-A 0537 would overlap with any other NY Bight lease area due to the distance of these wind farms from the other NY Bight lease sites, which exceeds 28 km at their closest points (Figure J-6). For the other lease areas, overlapping sound fields would be unrealistic due to safety concerns between the two operations, equipment logistics, and equipment bottlenecks. However, if pile-driving were to occur simultaneously, the spacing between concurrent pile-driving would have to be within 5 km for the sound fields to add in a meaningful way that could potentially change the impact ranges.

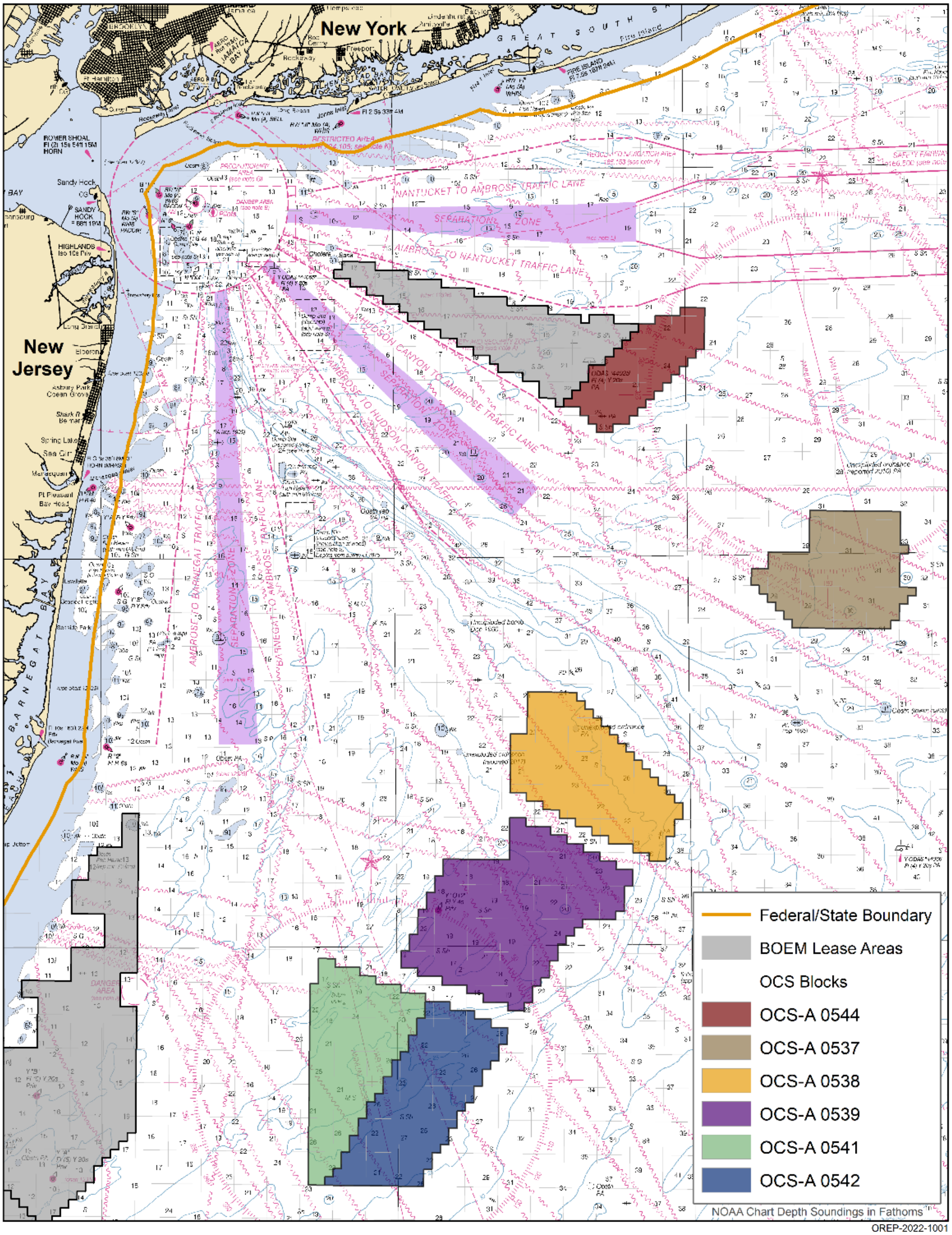

Figure J-6. NY Bight lease areas

J.4.7 Selection of AMMM Measures to Reduce Noise Impacts for the NY Bight

The results and mitigative principles from the New England case study were used to inform the selection of AMMM measures that can potentially reduce noise impacts on marine mammals in the NY Bight. These AMMM measures fall into several themes. Note that there are other noise-related AMMM measures that are not discussed further as they neither directly (e.g., reporting requirements) nor indirectly reduce acoustic impacts on marine mammals. The complete list of noise-related AMMM measures is provided in Table J-5 for reference.

J.4.7.1 Noise-related AMMM Measure Themes

Modifications in offshore wind development activity schedules that limit temporal exposure to noise include:

- Prohibit or minimize construction during periods when species of the highest conservation concern (the NARW) are expected to be present in greater numbers in the region (covered under MMST-4).
- Use daytime-only pile-driving (covered under MMST-4).
- Consider increased construction effort in periods with lowest animal density to complete more of the work and shorten total construction timelines:
    - Consider night-time and low-visibility conditions and enhance monitoring (MMST-6, MMST-1).

Measures that limit the spatial extent of noise (MUL-5) include:

- Prioritize low noise foundations when practicable (MUL-6).
- Apply noise abatement and mitigation devices when pile-driving (MUL-38).
- Receive Sound Level Limit (RSLL): Limit noise levels above the injury threshold for LFC to below a fixed distance from pile-driving, as well as any received level performance target aimed at reducing Level B harassment (note: BOEM will advise lessees once a second RSLL is developed in order to consider implementation concerns, if any) (MUL-22).
- Follow current International Maritime Organization (IMO) Guidelines for vessel quieting to the extent practicable (MUL-7).
- Use soft start for pile-driving (MUL-20).

Use of real-time and near-real time monitoring to inform adaptive mitigation measures include:

- Monitor clearance/shutdown zones using visual observation and real-time PAM during pile-driving (covered under MMST-2, MMST-4, ST-1).
- Visually monitor clearance/shutdown zones during HRG surveys (MMST-12).

- Use real-time PAM detection of marine mammals and alert system for operators near other concentrated development activities (e.g., transit or cable-laying corridor) or between lease areas to increase overall alertness of operators and readiness to implement shut-downs as needed (MM-2).

- Conduct Sound Field Verification (SFV) at every pile at 750 m (abbreviated "SFV"). "Thorough SFV" monitoring (defined as recording along a minimum of two radials with at least one radial containing three or more recorders) must be conducted for the first three foundations of a project, and when a foundation is to be installed with a substantially different set of values for key parameters like foundation type, hammer size, water depth. If levels measured in any SFV (thorough or abbreviated) imply the exceedance of authorized ranges to regulatory thresholds (specified by either the RSLL or approvals documents), thorough SFV must be conducted until SFVs from three consecutive foundations demonstrate adherence to the authorized levels following a foundation that exceeds said limit. Further, the lessee must comply with other terms and conditions directing action should SFV-measured ranges exceed those authorized. See Chapter 3 of BOEM's 2023 *Nationwide Recommendations for Impact Pile Driving Sound Exposure Modeling and Sound Field Measurement for Offshore Wind Construction and Operations Plans* for more information (MUL-29).

- Use sound field measurements to verify or adjust monitored impact zones and protected species observer (PSO) coverage (MMST-3, MMST-5).

Collection of baseline information to better anticipate potential impacts and further mitigate effects on marine mammals in the future includes:

- Conduct long-term PAM or contribute to a research fund to support PAM on the lease area for 1 year before construction through at least 10 years of operations (MM-3).

- Archive SFV data (MUL-29).

A final point to make about the selection of AMMM measures is that the NARW is the species of greatest concern. Therefore, many AMMM measures are designed specifically in consideration of the NARW and, in certain circumstances, may increase risk to other species (e.g., seasonal construction window). In other instances, AMMM measures provide similar benefits to other species. Table J-5 lists the noise-related AMMM measures for the NY Bight; for the full details of each measure, see Appendix G, *Mitigation and Monitoring*, of the PEIS.

Table J-5. Noise AMMM measures for the NY Bight

Measure ID	Measure	Discussed in this Analysis
MM-1	Reporting of all NARW sightings	--
MM-2	Real-time PAM monitoring and alert system for baleen whales	Yes
MM-3	Long-term PAM monitoring	Yes
MMST-1	Alternative monitoring plan	Yes
MMST-2	Impact pile-driving monitoring plan and PSO requirements	Yes
MMST-3	Pile-driving clearance and shutdown zone adjustments	Yes
MMST-4	Establishment of foundation pile-driving clearance and shutdown measures	Yes

Measure ID	Measure	Discussed in this Analysis
MMST-5	PSO coverage of expanded clearance/shutdown zones	Yes
MMST-6	Pile-driving visibility requirements	Yes
MMST-7	PSO coverage and training requirements	--
MMST-10	PSO reporting requirements for pile-driving shutdown events	-
MMST-12	Marine mammal and sea turtle geophysical survey clearance and shutdown zones and mitigations	Yes
MUL-5	Low noise best practices	Yes
MUL-6	Low noise foundations	Yes
MUL-7	Vessel noise reduction guidelines	Yes
MUL-20	Soft start for impact pile-driving	Yes
MUL-22	Received Sound Level Limit (RSLL)	Yes
MUL-29	Sound Field Verification (SFV) Process, Plan and Reporting	Yes
MUL-32	Daily, weekly, and final PSO reporting requirements (including foundation pile-driving)	--
MUL-35	Monthly/annual reporting requirements	--
MUL-38	Noise mitigation plan	--
ST-1	Monitoring zone for sea turtles during pile-driving	Yes

J.4.8 Discussion of Acoustic Impacts Under Alternative C

Under Alternative C, pile-driving would be expected to contribute the greatest to potential effects on marine mammals associated with noise. However, there are several ways it would differ from Alternative B due to the implementation of AMMM measures. With the adoption of AMMM measures in Alternative C, the spatial extent of noise associated with pile-driving in the NY Bight would be reduced with respect to Alternative B. In addition, the temporal overlap of construction activities with times when the NARW are present would be avoided to the extent possible. Procedures would be in place such that if animals came into the area in which noise effects may occur, the area would be monitored both visually and acoustically such that any marine mammal in the area should be detected. Procedures would be in place such that if an animal was detected pile-driving would stop, if safe to do so, until the animal(s) left the area. These issues are further discussed in the sections that follow.

J.4.8.1 Impacts of Noise AMMM Measures

Exposure Time

Under Alternative C, there are four AMMM measures related to the timing of pile-driving activity: (1) a seasonal restriction on pile-driving between January 1 and April 30 (covered under MMST-4), (2) a time-of-day restriction to daylight hours (covered under MMST-4), (3) a requirement for an alternative monitoring plan if construction were to occur outside daylight hours (MMST-1), and (4) low visibility condition requirements for pile-driving (MMST-6). With the adoption of a seasonal construction restriction, pile-driving would not be allowed to occur during periods when the NARW have historically been present in relatively higher numbers in the NY Bight/southern New England ecoregion (i.e., January 1–April 30) and further would not be allowed to occur in December unless a developer requests and is approved to do so. Exposure to pile-driving for the NARW would be minimized due to this seasonal restriction. This seasonal restriction would likely benefit other species with a similar phenology, or seasonal occurrence, as the NARW, such as harbor porpoise and seals. However, it may be less beneficial to species that may be present in higher numbers when construction is allowed, such as humpback whales, dolphins (Figure J-5), and other species not examined as part of this work. The benefit of a time-of-day restriction is that observers can visually monitor the area around pile-driving activity for marine mammals reliably. With additional low visibility and night-time monitoring requirements, enhanced monitoring (such as the use of technology to aid or supplement visual monitoring) would increase the likelihood of detecting marine life in the area. If pile-driving occurs only in daylight hours, this effectively means there is a period of time, i.e., during the night, when no pile-driving noise is produced. This measure may provide periods of time when animals that are present could recover from auditory fatigue or use the area in ways that they were unable to when construction noise was present. One advantage of pile-driving at any time of the day is that construction could be condensed to periods when animals are not present or in low abundance, effectively reducing the time that construction would occur when animals are present or in higher abundance. The risk assessment framework provides a tool for exploring such scenarios, as the value of either approach will depend on the specific context under consideration (i.e., species of interest, construction location, etc.). Additional modifications could also be made to fine-tune the construction window and further reduce potential exposure to the NARW and other species of interest by using the relative risk assessment framework.

Exposure Area

Under Alternative C, there are five AMMM measures related to the spatial extent of noise exposure: (1) prioritization for low noise foundations, when practicable (MUL-6); (2) noise abatement or mitigation devices when pile-driving (MUL-38); (3) received sound level limit to keep noise levels that exceed the injury threshold for LFC to within a fixed distance from a foundation (MUL-22); (4) incorporation of the IMO Guidelines for vessel quieting, where practicable (MUL-7); and (5) soft start for pile-driving (MUL-20).

With the prioritization of low noise foundations (MUL-6), the spatial extent of noise associated with pile-driving could be reduced with the use of foundation types other than impact-pile-driven monopiles, such as gravity-base, suction buckets, and other designs that do not require pile-driving. There are different noises associated with the installation of other foundation types; however, they are generally not as loud or as impulsive as impact pile-driving. The New England case study simulated the effect of mitigation on impact pile-driving by reducing the behavioral effect ranges from 20 km and 10 km to 15 km and 5 km for harbor porpoise and other marine mammals, respectively. This reduction is a reasonable expectation of the order of magnitude that noise mitigation AMMM measure (MUL-38) could reduce the spatial exposure extent of noise under Alternative C. The implementation of a received sound level limit (MUL-22) would limit the spatial extent of sound exposure. This AMMM measure was designed to ensure that injurious sound levels to LFC may only occur within a short and fixed distance from the pile-driving source such that the area can be sufficiently monitored for marine mammals. Although this AMMM measure would likely result in decreased noise exposure to all species, it prioritizes LFC. Therefore, it may have greater benefits to those species in comparison to others if, for example, the target was achieved by focusing only on a reduction of the lowest frequencies of pile-driving sound. Reaching this performance target could be achieved in several ways, including the application of various noise mitigations or the installation of low noise foundations. Implementation of the IMO Guidelines on vessel quieting may lead to decreases in vessel noise, which would decrease the risk of masking to marine mammals in the area. A final AMMM measure that may have benefits to marine life is the requirement for a soft start during pile-driving (MUL-20). The purpose of this AMMM measure is to capitalize on a potential avoidance response of some marine life by requiring that pile-driving begin at reduced power and strike rate (i.e., fewer strikes per time period) to elicit an avoidance response of any animals in the area before the sound reaches potentially impactful levels. There is no clear evidence for the effectiveness of this mitigation.

Other Potential Reductions in Impacts on Marine Mammals

Most of the other AMMM measures in place in Alternative C provide opportunities to detect marine mammals or sea turtles during construction and other development activity. With increased opportunities to detect marine mammals, there would be more opportunities to mitigate potential impacts should they arise.

For example, clearance and exclusion zones would be monitored visually and acoustically with real-time PAM during pile-driving (covered under MMST-2, MMST-4, ST-1). If a marine mammal is detected in those zones, procedures would be triggered to cease pile-driving, to the extent practicable, thereby avoiding a potential exposure that could cause injury or behavioral disturbance to an animal. Clearance and exclusion zones also would be visually monitored during HRG surveys for marine mammals and sea turtles, allowing for a potential exposure to be avoided by shutting down the activity should a marine mammal be present.

Real-time PAM (MM-2) would be conducted near any other concentrated development activities, such as laying cables or near a designated transit corridor. Any detections would be communicated to operators on the water. Although this measure would lead to increased opportunities to detect marine mammals in the area and increase operator vigilance of their presence, there is no mitigation directly tied to this AMMM measure. Therefore, any benefits would be indirect, such as if a vessel operator was able to use the detection to identify a marine mammal that it might otherwise have not visually observed. In this case, other AMMM measures are in place that would require the operator to avoid the marine mammal.

Sound field verification AMMM measures would not directly change the impact of noise on marine mammals, but the information collected during sound field verification would inform regulators whether the sound produced is within the allowable limits. If not, two AMMM measures (MMST-3 and MMST-5) are in place to ensure adequate monitoring of the area for marine mammals should they be present during construction. MMST-3 would adjust the monitored impact zones based on the sound field measurements, and MMST-5 would modify the number of visual observers based on the adjusted monitoring impact zones. These measures would ensure that any assumptions made in setting up the initial monitoring zones are met, and, if not, modifications are made to ensure adequate monitoring for marine mammals.

Several other monitoring AMMM measures are in place under Alternative C and could directly or indirectly lead to reduced impacts on marine mammals by updating our baseline understanding of marine mammals and potential noise impacts. For example, through long-term PAM monitoring, information about marine mammal presence, density, and phenology can be obtained, which can be used to update AMMM measures like the seasonal restrictions. However, under MM-3, data is likely to be collected on a yearly basis, and it is unclear how quickly, or even if, that information could be incorporated into the same project from which the data was collected. The data collected during sound field verification (MUL-29) may be used to adjust a project's shutdown, clearance, and monitoring zones if the sound field differs from what was authorized (MMST-3). In addition, sound field data may also be archived to inform the development of AMMM measures for subsequent projects.

The preceding discussion applies to the build-out of one or six projects. The sections that follow provide additional information specifically about these build-outs. However, without an understanding of many of the construction specifics of the NY Bight projects, it is difficult to predict the spatio-temporal impact of the build-out of one or six projects. Consequently, the discussions that follow are only illustrations of potential impacts and should not be considered as the only possibilities. Until more details are known, these should only be considered as hypothetical.

J.4.8.2 Build-out of One Project

Exposure Area

The implementation of required noise mitigation (MUL-38) could contribute to a reduction in the exposed area. For example, under the mitigated pile-driving scenarios in the New England case study, the behavioral impact radius was 5 km, or a 79-km^2 area, around a pile during a single impact pile-driving event. This dimension would equate to an area 45.4% of the size of the smallest NY Bight lease area (i.e., 174 km^2) or 15.5% of the size of the largest NY Bight lease area (i.e., 510 km^2).

With the implementation of MUL-22, a physical distance limit to injurious sound levels to LFC would be in place. A received level limit at 1 km around a pile would equate to an area 3.14 km^2 (i.e., 1.8% the smallest NY Bight lease area or 0.62% of the largest NY Bight lease area) ensonified by noise exceeding the LFC acoustic injury threshold.

BOEM may set other received sound level limits pertinent to behavioral impacts, which could further reduce the potential noise exposure area.

J.4.8.3 Build-out of Six Projects

Exposure Area

Under Alternative C, if pile-driving occurred on a single lease site at a time, the space exposed during pile-driving would not differ from the build-out of one project. If pile-driving occurred simultaneously on each of the six leases with no overlapping spatial exposure, a 5-km radius of exposure around each pile-driving event for potentially behavioral impactful sound levels would equate to an area equivalent to 471 km^2 (or 24% of the total leased NY Bight area); and a 1-km radius for injury levels for LFC would equate to 18 km^2 (or 0.95% of the total leased NY Bight area).

J.4.8.4 Conclusion

The AMMM measures identified in this analysis serve key functions in reducing noise impacts. The AMMM measures focused on reducing the spatio-temporal overlap of noise with marine life may have the greatest potential to reduce impacts. However, these AMMM measures are built on a foundation of knowledge that would not be possible without continued environmental monitoring to understand where and when animals are present and to characterize the sound fields associated with noise-generating activities. Therefore, the monitoring AMMM measures are also critical in ensuring that the spatio-temporal AMMM measures are most effective and are based on the best available and current information.

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K.5 Chapter 4, Other Required Impact Analysis

None.

Appendix L: Glossary

L.1 Glossary

Term	Definition
affected environment	Environment as it exists today that could be potentially affected by the Proposed Action or other action alternatives
algal blooms	Rapid growth of the population of algae, also known as *algae bloom*
allision	A moving ship running into a stationary ship
Avoidance, Minimization, Mitigation, and Monitoring measures	The programmatic avoidance, minimization, mitigation, and monitoring (AMMM) measures
anthropogenic	Generated by human activity
archaeological resource	Historical place, site, building, shipwreck, or other archaeological site
below grade	Below ground level
benthic	Related to the bottom of a body of water
benthic resources	The seafloor surface, the substrate itself, and the communities of bottom-dwelling organisms that live on and within these habitats
biogenic habitat	Benthic habitats created by structure-forming species (e.g., eelgrass, mussel beds, worm tubes)
Cetacea	Order of aquatic mammals made up of whales, dolphins, and porpoises
coastal habitat	Coastal areas where flora and fauna live, including salt marshes and aquatic habitats
coastal waters	Waters in nearshore areas where bottom depth is less than 98.4 feet (30 meters)
coastal zone	The lands and waters starting at 3 nautical miles (5.6 kilometers) from the land and ending at the first major land transportation route
commercial fisheries	Areas or entities raising and catching fish for commercial profit
commercial-scale wind energy facility	Wind energy facility usually greater than 1 megawatt (MW) that sells the produced electricity
concrete mattress	Concrete mat used to protect underwater pipelines or stabilize soil or the seabed; can be formed underwater by divers rolling out geosynthetic mattress fabric, zipping it together, and using a pump to fill it with highly fluid small aggregate concrete
criteria pollutant	One of six common air pollutants for which the United States Environmental Protection Agency sets National Ambient Air Quality Standards: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, or sulfur dioxide
critical habitat	Geographic area containing features essential to the conservation of threatened or endangered species
cultural resource	Historical districts, objects, places, sites, buildings, shipwrecks, and archaeological sites on the American landscape, as well as sites of traditional, religious, or cultural significance to cultural groups, including Native American Tribes
culvert	Structure, usually a tunnel, allowing water to flow under an obstruction (e.g., road, trail)
deflagration	Combustion of an explosive at subsonic speeds, driven by transfer of heat
demersal	Living close to the ocean floor
demosponge	Class of sponges that account for more than 90% of all sponges alive, including bath, boring, barrel, carnivorous, and freshwater sponges

Term	Definition
dredging	Removal of sediments and debris from the bottom of lakes, rivers, harbors, and other waterbodies
duct bank	Underground structure that houses the onshore export cables, which consists of polyvinyl chloride pipes encased in concrete
ecosystem	Community of interacting living organisms and nonliving components (such as air, water, soil)
electromagnetic field	A field of force produced by electrically charged objects and containing both electric and magnetic components
embayment	Recessed part of a shoreline
endangered species	A species that is in danger of extinction in all or a significant portion of its range
Endangered Species Act–listed species	Species listed under the Endangered Species Act (ESA) of 1973 (as amended)
ensonification	The process of filling with sound
environmental protection measure	Measure proposed to avoid or minimize potential impacts
environmental consequences	The potential direct, indirect, and cumulative impacts that the construction, operations and maintenance (O&M), and decommissioning of a proposed project would have on the environment
environmental justice communities	Minority and low-income populations potentially affected by a proposed project, as defined by both federal and applicable state criteria
epifauna	Fauna that lives on the surface of a seabed (or riverbed), or is attached to underwater objects or aquatic plants or animals
essential fish habitat	“Those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (50 Code of Federal Regulations [CFR] part 600)
export cable	Cable connecting the offshore wind facility to the onshore electrical grid power
export cable corridor	Area identified for routing the entire length of the onshore and offshore export cables
federal aids to navigation	Visual references operated and maintained by the United States Coast Guard (USCG), including radar transponders, lights, sound signals, buoys, and lighthouses, that support safe maritime navigation
finfish	Vertebrate and cartilaginous fish species, not including crustaceans, cephalopods, or other mollusks
for-hire commercial fishing	Commercial fishing on a for-hire vessel (i.e., a vessel on which the passengers contribute to a person having an interest in the vessel in exchange for carriage)
for-hire recreational fishing	Fishing from a vessel carrying a passenger for hire who is engaged in recreational fishing
foundation	The bases to which the wind turbine generators (WTGs) and offshore substations (OSSs) are installed on the seabed; seven types of foundations are considered in the RPDE: monopile, piled jacket, suction mono-bucket, suction bucket jacket, tri-suction pile caisson, and gravity-based
frond mattress	Anti-scour protection consisting of aerated polyethylene fronds that when installed on the seabed will naturally float to resemble natural seaweed; as local currents transport sediment through the frond mattress strands encouraging sand, silt, or soil to be deposited onto the mattress, the frond mattress forms a natural fiber reinforced sand bank to protect the area in question
geomagnetic	Relating to the magnetism of the Earth
gravity-based structure	Typically constructed of steel, concrete, or a combination of both; gravity-based structures sit on top of the seafloor and are not pile driven

Term	Definition
hard-bottom habitat	Benthic habitats composed of hard-bottom (e.g., cobble, rock, and ledge) substrates
historic property	As defined in 36 CFR 800.16(l)(1), a prehistoric or historic district, site, building, structure, or object that is eligible for or already listed in the National Register of Historic Places (NRHP); also includes any artifacts, records, and remains (surface or subsurface) related to and located within such a resource
historical resource	There is no common or consistent legal definition for a historic resource; therefore, it is defined the same as an historic property; a prehistoric or historic district, site, building, structure, or object that is eligible for or already listed in the NRHP; also includes any artifacts, records, and remains (surface or subsurface) related to and located within such a resource
horizontal directional drilling	Trenchless technique for installing underground cables, pipes, and conduits using a surface-launched drilling rig
hull	Watertight frame or body of a ship
infauna	Fauna living in the sediments of the ocean floor (or river or lake beds)
interarray cables	Cables connecting the wind turbine generators to the electrical service platforms
Interdunal	Habitat between dunes
invertebrate	Animal with no backbone
jacket foundation	Latticed steel frame with three or four supporting piles driven into the seabed
jack-up vessel	Mobile and self-elevating platform with buoyant hull
jet excavation	Process of moving or removing soil with a jet
jet plowing	Plowing in which the jet plow, with an adjustable blade, or plow, rests on the seafloor and is towed by a surface vessel; the jet plow creates a narrow trench at the designated depth, while water jets fluidize the sediment within the trench
knot	Unit of speed equaling 1 nautical mile (1.8 kilometer) per hour
landfall site	The shoreline landing site at which the offshore cable transitions to onshore
marine mammal	Aquatic vertebrate distinguished by the presence of mammary glands, hair, three middle ear bones, and a neocortex (a region of the brain)
marine waters	Waters in offshore areas where bottom depth is more than 98.4 feet (30 meters)
mechanical cutter	Method of submarine cable installation equipment that involves a cutting wheel or excavation chain to cut a narrow trench into the seabed allowing the cable to sink under its own weight or be pushed to the bottom of the trench via a cable depressor
mechanical plow	Method of submarine cable installation equipment that involves pulling a plow along the cable route to lay and bury the cable; the plow's share cuts into the soil, opening a temporary trench, which is held open by the side walls of the share, while the cable is lowered to the base of the trench via a depressor; some plows may use additional jets to fluidize the soil in front of the share
metocean	The syllabic abbreviation of meteorology and oceanography; a metocean study is used to estimate the environmental conditions including the wind, wave, and climate conditions found at a certain location
monopile or monopile foundation	A long steel tube driven into the seabed that supports a tower
mooring dolphin	Isolated marine structure used for mooring and securing vessels near pier structures to control the transverse movement of vessels while docked
nautical mile	A unit used to measure sea distances and equivalent to approximately 1.15 miles (1.85 kilometers)
NY Bight area	The New York Bight (NY Bight) is the geological identification applied to the roughly triangular indentation, regarded as a bight, along the Atlantic coast of the United

Term	Definition
	States that extends northeasterly from Cape May Inlet in New Jersey to Montauk Point on the eastern tip of Long Island
NY Bight lease areas	Commercial lease areas OCS-A 0537, OCS-A 0538, OCS-A 0539, OCS-A 0541, OCS-A 0542, and OCS-A 0544
NY Bight projects	Hypothetical projects that may be proposed within the six NY Bight lease areas
offshore project area	The offshore components that collectively make up the NY Bight offshore project area include the lease areas, WTGs, OSSs, scour protection for foundations, interarray and substation interconnection cables, and offshore export cables
offshore substation	The interconnection point between the WTGs and the export cable; the necessary electrical equipment needed to connect the interarray cables to the offshore export cables
onshore project area	The onshore components that collectively make up the NY Bight onshore project area include the landfall sites, the sea-to-shore transition that connects the offshore export cables to the onshore export cables, onshore export cable routes to onshore substations or converter stations, and the connection from the onshore substations or converter stations to the existing grid
onshore substation	Substation connecting a project to the existing bulk power grid system
operations and maintenance facilities	Would include offices, control rooms, warehouses, shop space, and pier space
Outer Continental Shelf	All submerged land, subsoil, and seabed belonging to the United States but outside of states' jurisdiction
permanent threshold shift	Affecting animals as a result of sound exposure, permanent threshold shift or PTS is an irreversible loss of hearing due to hair cell loss or other structural damage to auditory tissues
pile	A type of foundation akin to a pole
pile-driving	Installing foundation piles by driving them into the seafloor
pinnipeds	Carnivorous, semiaquatic marine mammals with fins, also known as seals
pin pile	Small-diameter pipe driven into the ground as foundation support
plume	Column of fluid moving through another fluid
private aids to navigation	Visual references on structures positioned in or near navigable waters of the United States, including radar transponders, lights, sound signals, buoys, and lighthouses, that support safe maritime navigation; permits for the aids are administered by USCG
Proposed Action	Specifically Alternative C, under which AMMM measures would be adopted such that the potential impacts described in Alternative B may be avoided, reduced, or mitigated
protected species	Endangered or threatened species that receive federal protection under the ESA of 1973 (as amended)
quay	Concrete, stone, or metal platform lying alongside or projecting into water for loading and unloading ships
Representative Project Design Envelope (RPDE)	The range of technical parameters that describe a wind energy project that could occur within the NY Bight lease areas
rock bags	Bags constructed of mesh material filled with rock or rip rap, making it a flexible protection system for marine construction work
scour protection	Protection consisting of rock and stone that would be placed around all foundations to stabilize the seabed near the foundations as well as the foundations themselves
scrublands	Plant community dominated by shrubs and often also including grasses and herbs
seabed spacer	An underwater cable system designed to hold and protect cables

Term	Definition
sessile	Attached directly by the base
silt substrate	Substrate made of a granular material originating from quartz and feldspar, and whose size is between sand and clay
soft-bottom habitat	Benthic habitats that include soft-bottom (i.e., unconsolidated sediments) and hard-bottom (e.g., cobble, rock, ledge) substrates
spud barge	Sometimes called a jack-up barge, a spud barge is a specialized type of barge commonly used for marine construction operations; the barge is moored by steel shafts or through-deck piling, which are essentially pipes driven right into the soil or sand at the bottom of the water to provide stability
substrate	Earthy material at the bottom of a marine habitat; the natural environment that an organism lives in
suction-bucket jacket	Latticed steel frame with three to four supporting suction-bucket foundations securing the structure to the seabed
suspended sediments	Very fine particles that remain in suspension in water for a considerable period of time without contact with the bottom; such material remains in suspension due to the upward components of turbulence and currents, or by suspension
temporary threshold shift	Affecting animals as a result of sound exposure, temporary threshold shift or TTS is a relatively short-term (e.g., within several hours or days), reversible loss of hearing following noise exposure, often resulting from hair cell fatigue
threatened species	A species that is likely to become endangered within the foreseeable future
tidal energy project	Project related to the conversion of the energy of tides into usable energy, usually electricity
tidal flushing	Replacement of water in an estuary or bay because of tidal flow
trawl	A large fishing net dragged by a vessel at the bottom or in the middle of sea or lake water
turbidity	A measure of water clarity
utility right-of-way	Registered easement on private land that allows utility companies to access the utilities or services located there
vibracore	Technology/technique for collecting core samples of underwater sediments and wetland soils
viewshed	Area visible from a specific location
visual resource	The visible physical features on a landscape, including natural elements such as topography, landforms, water, vegetation, and anthropogenic structures
wetland	Land saturated with water, and includes marshes and swamps
wind energy	Electricity from naturally occurring wind
wind energy area	Areas with significant wind energy potential and defined by Bureau of Ocean Energy Management (BOEM)
wind turbine generator	Component that puts out electricity in a structure that converts kinetic energy from wind into electricity

Appendix M: List of Preparers and Reviewers

M.1 List of Preparers and Reviewers

Table M-1. Bureau of Ocean Energy Management contributors

Name	Role/Resource Area
Ajilore, Ololade	Navigation and Vessel Traffic
Arzt, Tamara	Endangered Species Act (ESA) Sections
Aspromonti, Lauren	Representative Project Design Envelope (RPDE)
Baker, Arianna	Navigation and Vessel Traffic
Baker, Kyle	Marine Mammals; Sea Turtles
Beser, Todd	Coastal Habitat and Fauna
Bigger, David	Bats; Birds; Coastal Habitats
Brune, Genevieve	Land Use and Coastal Infrastructure
Bucatari, Jennifer	Other Uses (Marine Minerals)
Chaiken, Emma	Commercial Fisheries and For-Hire Recreational Fishing; Recreation and Tourism
Chaky, Sindey	Land Use and Coastal Infrastructure
Cornelison, Meghan	Demographics, Employment, and Economics; Environmental Justice; Scenic and Visual Resources
Davidson, Megan	Deputy Project Manager
Draher, Jennifer	Water Quality
Fulling, Gregory	Marine Mammals; Sea Turtles
Gange, Joshua	Other Uses (Transmission Lines)
Gentry, Lisa	Navigation and Vessel Traffic
Hooker, Brian	Commercial Fisheries and For-Hire Recreational Fishing
Horrell, Christopher	Cultural Resources
Hosch, Peter	RPDE
Houghton, Bonnie	Other Uses (Military Use and Aviation)
Howson, Ursula	Benthic Resources; Coastal Habitats; Commercial Fisheries and For-Hire Recreational Fishing; Finfish, Invertebrates, and Essential Fish Habitat (EFH); Other Uses; Wetlands
Jensen, Brandon	Benthic Resources; Commercial Fisheries and For-Hire Recreational Fishing; Finfish, Invertebrates, and EFH
Jensen, Mark	Demographics, Employment, and Economics; Recreation and Tourism
Jordan, Brian	Cultural Resources
Kates Varghese, Hilary	Acoustics
Mansfield, Laura	Environmental Justice
McCarty, John	Recreation and Tourism; Scenic and Visual Resources
McGuffin, Andrew	Other Uses (Cables and Radars); RPDE
Moshier, Marissa	Cultural Resources
Le, Jennifer	RPDE
O'Connell, Daniel	RPDE
Oliver, Elizabeth	Tribal Consultation
Remsen, Andrew	Water Quality
Renick, Hillary	Tribal Consultation

Name	Role/Resource Area
Richards, Renee	Other Uses (Unexploded Ordnances)
Schnitzer, Laura	Cultural Resources
Sharuga, Stephanie	Water Quality; Wetlands; ESA Sections; Benthic Resources
Slayton, Ian	Air Quality; Cumulative Impacts
Staaterman, Erica	Acoustics
Stokely, Sarah	Cultural Resources
Strain, Courtney	Project Manager
Sullivan, Kimberly	Environmental Justice
Vishnubhotla, Srinivas	RPDE
White, Timothy	Bats; Birds
Wisman, Jeri	Marine Mammals
Wolf, Jacob	Air Quality
Wolvovsky, Eric	Air Quality
Yerkes, Russell	Graphics

Table M-2. Reviewers

Name	Title	Agency
Bureau of Ocean Energy Management (BOEM) and U.S. Department of the Interior (DOI) Reviewers		
Bosyk, Jennifer	Chief, Branch of Environmental Coordination	BOEM
Hildreth, Emily	Policy Analyst	BOEM
Jordan, Brian	Chief, Branch of Environmental Consultation	BOEM
Meléndez-Arreaga, Pedro	Lead Attorney-Advisor, Office of the Solicitor	DOI
Monroe, Lori	Office of the Solicitor	DOI
Vorkoper, Stephen	Office of the Solicitor	DOI
Cooperating and Participating Agency Reviewers		
Heckman, Andrea	Environmental Scientist	Bureau of Safety and Environmental Enforcement
Berry Engler, Lisa	Director	Massachusetts Office of Coastal Zone Management
Boeri, Robert	Project Review Coordinator	Massachusetts Office of Coastal Zone Management
Bailey, Blair	General Counsel	New Bedford Port Authority
Brunatti, Megan	Deputy Chief of Staff	New Jersey Department of Environmental Protection
Lange, Elizabeth	Environmental Specialist 2	New Jersey Department of Environmental Protection
Bland, Sarah	Deputy Regional Administrator	National Marine Fisheries Service
Tuxbury, Susan	Fishery Biologist/Wind Coordinator	National Marine Fisheries Service
Semel, Hilary	Director and General Counsel	New York City Mayor's Office of Environmental Coordination
Hepner, Tyler	Attorney	New York State Department of Environmental Conservation
McLean, Laura	Ocean and Lakes Policy Analyst	New York State Department of State
Handell, Naomi	Regulatory Program Manager	U.S. Army Corps of Engineers

Name	Title	Agency
Pritts, Jared	NEPA Subject Matter Expert	U.S. Army Corps of Engineers
Aulner, Jacob	Navigation Standards Division	U.S. Coast Guard
Desautels, Michele	Maritime Energy and Marine Planning	U.S. Coast Guard
Austin, Mark	Environmental Engineer	U.S. Environmental Protection Agency
Nyer, Samantha	Physical Scientist	U.S. Environmental Protection Agency
Ciappi, Michael	Senior Fish and Wildlife Biologist	U.S. Fish and Wildlife Service
Papa, Steve	Senior Fish and Wildlife Biologist	U.S. Fish and Wildlife Service
Vail-Muse, Stephanie	Regional Energy Coordinator	U.S. Fish and Wildlife Service

Table M-3. Consultants

Name	Role/Resource Area
ICF	
Baer, Sarah	Land Use and Coastal Infrastructure
Birnbaum, David	Cultural Resources
Brown, Sheri	Scenic and Visual Resources
Cherry, Kenneth	Lead Editor
Coleman, Randall	Project Manager
Diller, Elizabeth	Program Director
Ernst, David	Air Quality
Grove, Megan	Deputy Project Manager
Hatfield, Teresa	Navigation and Vessel Traffic
Johnson, David	Bats; Birds; Wetlands
Jost, Rebecca	Other Uses
Larsen, Rick	Wetlands
Lassell, Susan	Cultural Resources and Section 106 Lead
Lundstrom, Kristen	Support Editor
Mahoney, Elisabeth	Project Coordinator; Administrative Record; Other Uses
Mountain-Castro, Jenelle	Publications Specialist
Muntz, Alice	Cultural Resources
Piggott, Jennifer	Facilitator and Public Involvement Lead
Powell, Drew	Bats; Birds
Read, Brent	Geographic Information Systems
Stoll, Jean	Cultural Resources
Sullivan, Neil	Senior Advisor
CSA Ocean Sciences Inc.	
Barkaszi, Mary Jo	Marine Mammals; Sea Turtles
Cady, Robert	Quality Assurance/Quality Control (QA/QC)
Cahill, Melanie	CSA Project Manager
Gifford, Kathleen	Water Quality; Finfish, Invertebrates, and Essential Fish Habitat
Hartigan, Kayla	Sea Turtles
McMahon, Adrianna	Benthic Resources
Stevens, Tara	Marine Mammals
Tiggelaar, John	Commercial Fisheries and For-Hire Recreational Fishing

Name	Role/Resource Area
Avanti Corporation	
DaCruz, Amelia	Demographics, Employment, and Economics; Recreation and Tourism
Dempsey, Emma	Demographics, Employment, and Economics; Environmental Justice
Petrazzuolo, Gary	Demographics, Employment, and Economics
Petrazzuolo, Lynn	Environmental Justice

Appendix N: Distribution List

The Draft Programmatic Environmental Impact Statement (PEIS) is available in electronic form for public viewing at https://www.boem.gov/renewable-energy/state-activities/new-york-bight. Hard copies and digital copies of the Draft PEIS can be requested by contacting the Bureau of Ocean Energy Management (BOEM), Office of Environmental Programs in Sterling, Virginia at (703) 787-1703. Publication of the Draft PEIS initiates a 45-day comment period where government agencies, members of the public, and interested stakeholders can provide comments and input. BOEM will accept comments in any of the following ways:

- In hard copy form, delivered by mail, enclosed in an envelope labeled “NY BIGHT PEIS” and addressed to Chief, Division of Environmental Assessment, Office of Environmental Programs, Bureau of Ocean Energy Management, 45600 Woodland Road (VAM-OEP), Sterling, Virginia 20166
- Through the regulations.gov web portal by navigating to https://www.regulations.gov/, searching for docket number “BOEM-2024-0001,” and clicking the “Comment” button. Enter your information and comment, then click “Submit Comment.”
- By attending one of the public meetings at the location and dates listed in the Notice of Availability and providing written or verbal comments.

BOEM will use comments received during the public comment period to inform its preparation of the Final PEIS, as appropriate. Notification lists for the Draft PEIS are provided in Tables N-1 through N-4.

N.1 Notification List

Table N-1. Federal agencies

Agency	Contact
Cooperating Federal Agencies	
National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS)	Michael Pentony, Susan Tuxbury, Julie Crocker, Jaclyn Daly, Cristi Reid, Sharon Benjamin, Timothy Cardiasmenos, Keith Hanson
National Park Service (NPS) Region 1	Mary Krueger, Kristin Andel
U.S. Department of the Interior (DOI), Bureau of Safety and Environmental Enforcement (BSEE)	Andrea Heckman
U.S. Army Corp of Engineers (USACE)	Naomi Handell, Jared Pritts
U.S. Coast Guard (USCG)	Jacob Aulner, Maureen Kallgren
U.S. Environmental Protection Agency (USEPA) Region 2	Anne Rosenblatt, Mark Austin
U.S. Fish and Wildlife Service (USFWS)	Ian Drew, Jaron Ming, Stephanie Vail-Muse, Steve Papa, Michael Ciappi

Table N-2. Cooperating Tribal governments and state and local agencies

Agency	Contact
Cooperating Tribal Government	
Stockbridge-Munsee Community Band of Mohican Indians	Jeffrey C. Bendremer, Bonney Hartley
Mashantucket (Western) Pequot Tribal Nation	Michael Kickingbear Johnson
Cooperating State and Local Agencies	
Massachusetts Office of Coastal Zone Management	Lisa Engler, Robert Boeri
New Bedford Port Authority	John Regan, Blair Bailey
New Jersey Board of Public Utilities (NJ BPU)	Jim Ferris, Kira Lawrence
New Jersey Department of Environmental Protection (NJ DEP)	Megan Brunatti
New York Department of State (NY DOS)	Laura McLean, Terra Haight
New York State Department of Environmental Conservation (NYSDEC)	Karen Gaidasz
Participating State and Local Agencies	
New York City (NYC) Mayor's Office	Hilary Semel

Table N-3. Tribal Nations

Tribal Nation	Contact
Absentee-Shawnee Tribe of Indians of Oklahoma	Devon Frazier, Tribal Historic Preservation Officer John Raymond Johnson, Governor
Delaware Tribe of Indians	Susan Bachor, Historic Preservation Representative, Delaware Tribe Historic Preservation Office Brad Kills Crow, Chief
Eastern Shawnee Tribe of Oklahoma	Brett Barnes, Cultural Preservation Director Paul Barton, Tribal Historic Preservation Officer Glenna Wallace, Chief
Mashantucket (Western) Pequot Tribal Nation	Michael Kickingbear Johnson
Mashpee Wampanoag Tribe	David Weeden, Tribal Historic Preservation Officer
Mohegan Tribe of Connecticut	James Gessner, Chairman James Quinn, Tribal Historic Preservation Officer
Stockbridge-Munsee Community Band of Mohican Indians	Shannon Holsey, President Jeffrey C. Bendremer, Tribal Historic Preservation Officer
The Delaware Nation	Deborah Dotson, President Katelyn Lucas, Tribal Historic Preservation Officer Carissa Speck, Tribal Historic Preservation Director
The Narragansett Indian Tribe	John Brown, Tribal Historic Preservation Officer Dinalyn Spears, Natural Resources Manager Anthony Dean Stanton, Chief Sachem
The Shinnecock Indian Nation	Jeremy Dennis, Junior Tribal Historic Preservation Officer Bianca Collins, Councilwoman Secretary Rebecca Genia Bryan Polite, Chairman Josephine Smith, Director, Cultural Resources Department

Tribal Nation	Contact
	Shavonne Smith, Director Shinnecock Environmental Department Tela Troge, Esquire
Wampanoag Tribe of Gay Head (Aquinnah)	Cheryl Andrews-Maltais, Chairwoman Lael Echo-Hawk, General Counsel Barbara Spain, Executive Assistant Bettina Washington, Tribal Historic Preservation Officer

Table N-4. Section 106 Consulting Parties

Organization Type	Organization	Contact
Federal Government	U.S. Advisory Council on Historic Preservation	Christopher Daniel, Federal Property Management Section, Program Analyst Chris Koeppel, Federal Property Management Section, Assistant Director
	U.S. Army Corps of Engineers	Naomi Handell, Regulatory Program Manager, Operations and Regulatory Division, USACE North Atlantic Division Jared Pritts
	U.S. Bureau of Safety and Environmental Enforcement	W. Shawn Arnold, Federal Preservation Officer/Senior Marine Archaeologist Daniel "Herb" Leedy, Supervisory Biologist
	U.S. Environmental Protection Agency	Mark Austin, Team Leader, Environmental Reviews
	U.S. National Park Service	Mary Krueger, Region 1 Energy Specialist Kirstin Andel, Region 1 Energy Specialist
Federally Recognized Tribes	Absentee-Shawnee Tribe of Indians of Oklahoma	Devon Frazier, Tribal Historic Preservation Officer (THPO) John Raymond Johnson, Governor
	Delaware Tribe of Indians	Susan Bachor, Historic Preservation Representative, Delaware Tribe Historic Preservation Office Brad Kills Crow, Chief
	Eastern Shawnee Tribe of Oklahoma	Brett Barnes, Cultural Preservation Director Paul Barton, THPO Glenna Wallace, Chief
	Mashantucket (Western) Pequot Tribal Nation	Michael Kickingbear Johnson, Acting THPO
	Mashpee Wampanoag Tribe	David Weeden, THPO
	Mohegan Tribe of Connecticut	James Gessner, Chairman James Quinn, THPO
	Stockbridge-Munsee Community Band of Mohican Indians	Jeffrey C. Bendremer, THPO
	The Delaware Nation	Deborah Dotson, President Katelyn Lucas, Historic Preservation Assistant Carissa Speck, Tribal Historic Preservation Director
	The Narragansett Indian Tribe	John Brown, THPO Dinalyn Spears, Natural Resources Manager Anthony Dean Stanton, Chief Sachem

Organization Type	Organization	Contact
	The Shinnecock Indian Nation	Jeremy Dennis, Junior THPO Bianca Collins, Councilwoman Secretary Rebecca Genia Bryan Polite, Chairman Josephine Smith, Director, Cultural Resources Department Shavonne Smith, Director Shinnecock Environmental Department Tela Troge, Esquire
	Wampanoag Tribe of Gay Head (Aquinnah)	Cheryl Andrews-Maltais, Chairwoman Lael Echo-Hawk, General Counsel Barbara Spain, Executive Assistant Bettina Washington, THPO
Local Government	Atlantic County	Frances Brown, Principal Planner Gerald DelRosso, County Administrator Ranae Fehr, Department Head / Director of Planning and Engineering
	Avon-by-the-Sea Borough	Ed Bonanno, Mayor Anna Bongiorno, Acting Municipal Clerk
	Borough of Beach Haven	Jaime Baumiller, Council President Robert Stern, Resident
	Borough of Highlands	Karen Chelak, Councilmember Donald Melnyk, Councilmember
	Borough of Point Pleasant Beach	Paul Kanitra, Mayor Kristen O'Rourke, Quality of Life Director
	Borough of Sea Bright	Brian Kelly, Mayor
	Borough of Seaside Park	Sandy Martin, Clerk John Peterson Jr., Mayor
	Borough of Spring Lake	Bryan Dempsey, Borough Administrator Jennifer Naughton, Mayor
	Cape May County	Rita M. Rothberg, Cape May County Clerk, Adjuster and County Historian
	City of Absecon	Carie Crone, City Clerk Kim Horton, Mayor
	City of Asbury Park	Jason D. Harzold, Client Manager, T and M Associates
	City of Hoboken	Ravi Bhalla, Mayor Christopher A. Brown, Community Development/Planning Director James J. Farina, City Clerk
	City of North Wildwood	Patrick Rosenello
	Monmouth County	Joseph Barris, Planning Director David Schmetterer, Assistant Planning Director
	Monmouth County Park System	Paul Gleitz, Principal Park Planner Gail Hunton, Chief, Acquisition & Design Department Anna Luiten, Environmental Specialist
	Nassau County	Kenneth Arnold, Commissioner of Public Works
	Suffolk County	Lisa Broughton, Energy Director

Organization Type	Organization	Contact
	Town of Babylon	Rachel Scelfo, Commissioner, Office of Planning and Development
	Town of Islip	James C. Brennan, Deputy Commissioner, Planning & Development Ela Dokonal, Commissioner, Planning & Development
	Town of Oyster Bay	George Baptista, Jr., Deputy Commissioner Julia Schneider, Director of TEQR
	Township of Brick	Keith Rella, Public Information/Administration
	Township of Hamilton	Erin Crean, Director of Community Development Joseph Kostecki, Township Administrator
	Township of Middletown	Tony Perry, Mayor
	Township of Stafford	Matthew von der Hayden, Township Administrator/Director of Water & Sewer Utility
	Village of Bellport	John Kocay, Clerk Robert J. Rosenberg, Deputy Mayor
	Village of Patchogue	Lori B. Devlin, Village Clerk Marian Russo, Executive Director, Community Development Dennis Smith, Assistant to the Mayor
Other Potentially Interested Parties	Green-Wood Cemetery	Joseph Charap Richard Moylan, President
	Hempstead Harbor Protection Committee	Eric Swenson, Executive Director
	Point O'Woods Association	William Cook, Special Counsel
Preservation Organization	Bay Shore Historical Society	Barry Dlouhy, President
	Greater Cape May Historical Society	Harry Bellangy, President and Historian Kathleen Wyatt, Administrator and Secretary
	Historic Districts Council	Lucie Levine, Preservation Advocacy and Community Outreach Manager Diego Robayo, Public Relations Specialist Frampton Tolbert, Executive Director
	Historical Society of Highlands	Rita Moles, Secretary Shelia Weinstock, President
	Ocean City Historical Museum	John Loeper, President
	Preservation Alliance of Spring Lake	Joseph Rizzo, President
	Romer Shoal Light	Keith Kilgannon, President
	Save Long Island Beach Inc.	Robert Stern, President
	The Noyes Museum of Art	Michael Cagno, Executive Director
	West Bank Lighthouse	Keith Kilgannon, President
State Government	New Jersey State Museum	Nicole Jannotte
	New York State Parks, Recreation & Historic Preservation, Long Island State Parks Region 9	Jill Dietrich, Liaison George Gorman, Jr., Regional Director

Organization Type	Organization	Contact
	New York State Parks, Recreation and Historic Preservation	Erik Kulleseid, Commissioner
State Government (SHPO)	New Jersey Department of Environmental Protection, Historic Preservation Office	Meghan Baratta, Supervising Historic Preservation Specialist Jennifer Leynes, Historic Preservation Specialist 2 Katherine Marcopul, Deputy State Historic Preservation Officer Jesse West-Rosenthal, Historic Preservation Specialist 2
	New York State Historic Preservation Office	Nancy Herter, Director, Technical Preservation Services Bureau Tim Lloyd, PhD, Archaeologist Daniel Mackay, Deputy Commissioner for Historic Preservation
State Recognized Tribe	Lenape Indian Tribe of Delaware	Dennis J. Coker, Principal Chief
Lessee	Atlantic Shores Offshore Wind Bight (OCS-A 0541)	Jennifer Daniels, Tribal Liaison Officer, Development Director Joshua Gomez, Permitting Lead Megan Hayes, Senior Permitting Lead
	Attentive Energy (OCS-A 0538)	Isabel Kaubisch, Permitting Program Manager Laura Klewicki, Federal Permitting Specialist Eric Scuoteguazza, Tribal Liaison Officer
	Invenergy (OCS-A 0542)	Carmen Bernett, Senior Manager, Environmental Compliance and Strategy Hope E. Luhman, PhD, RPA, Tribal Liaison Officer Shannon Stewart, Director, Environmental Compliance and Strategy
	Bluepoint Wind (OCS-A 0537)	Kori Ktona Barnes, Federal Permitting Manager Michael Brown John Dempsey, Chief Executive Officer Lia Howard, Head of Permitting
	Community Offshore Wind (OCS-A 0539)	Justin Bedard, Tribal Liaison Officer Katherine Miller, Federal Permitting Project Manager Daniel Sieger, Head of Development
	Vineyard Mid-Atlantic (OCS-A 0544)	Geri Edens, Director of Permitting Laura George, Permitting Manager Nate Mayo, Tribal Liaison Officer, Public Affairs Director Esther Siskind, Federal Permitting Lead

Appendix O: Scoping Report

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Abbreviations and Acronyms

Acronym	Definition
AMMM	avoidance, minimization, mitigation, and monitoring
BOEM	Bureau of Ocean Energy Management
CEHA	Coastal Erosion Hazard Areas
COP	Construction and Operations Plan
CZMA	Coastal Zone Management Act
DACs	disadvantaged communities
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EMF	electromagnetic field
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
GW	gigawatts
HDD	Horizontal Directional Drilling
IOOS	Integrated Ocean Observing System
MMPA	Marine Mammal Protection Act
NAAQS	National Ambient Air Quality Standards
NCCOS	National Centers for Coastal Ocean Science
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NJDEP	New Jersey Department of Environmental Protection
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NY Bight	New York Bight
NYS	New York State
NYS OPRHP	New York State's Office of Parks, Recreation and Historic Preservation
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York Department of State
NYSDOT	New York State Department of Transportation
NYSDPS	New York State Department of Public Service
NYSERDA	New York State Energy Research & Development Authority's
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
PA	Programmatic Agreement
PAM	Passive Acoustic Monitoring
PEIS	Programmatic Environmental Impact Statement
PLAs	project labor agreements
ppm	parts per million
RMI	Research and Monitoring Initiative
ROW	right-of-way
RPDE	representative project design envelope

Acronym	Definition
RWSC	Regional Wildlife Science Collaborative for Offshore Wind
SAV	submerged aquatic vegetation
SCFWF	Significant Coastal Fish and Wildlife Habitats
SHPOs	State Historic Preservation Officers
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VMS	Vessel Monitoring Systems
WEA	Wind Energy Area
WSR	Wild, Scenic, & Recreational Rivers
WTG	Wind Turbine Generator

O.1 Introduction

On July 15, 2022, the Bureau of Ocean Energy Management (BOEM) published a Notice of Intent (NOI) to prepare the New York Bight (NY Bight) Programmatic Environmental Impact Statement (PEIS), which will analyze potential impacts from wind energy development activities in the NY Bight region. The initial 30-day public comment period opened on July 15, 2022. The period was extended to August 30, 2022. Public input was collected via regulations.gov (docket BOEM-2022-0034). Through October 7, 2022, BOEM received a total of 43 comments, all of which were unique.

The comments came from a variety of stakeholders including federal, State, non-governmental associations, and individual commenters. This report indicates the commenters that made particular arguments, as represented by footnotes following summary statements. The footnotes include the names of individuals and organizations. The footnotes following summary statements provide representative examples of commenters providing particular arguments, and are not meant to be exhaustive of each commenter providing a similar argument.

Public comments were analyzed using the CommentWorks® software product. As a first step, comments submitted to regulations.gov and received via email were downloaded and processed to be imported into CommentWorks. A hierarchical outline was developed to include key issues provided by BOEM staff. Analysts reviewed the comment letters, identifying the substantive excerpts within each submission ("bracketing"), and used the issue outline to associate each excerpt to the issue(s) to which it applies ("coding"). The comments were then summarized by issue as presented in this report. The full text of all public scoping comments received can be viewed online at http://www.regulations.gov by typing "BOEM-2022-0034" in the search field.

Table O-1 lists the commenters.

Table O-1. Index of comment submissions sorted by submission number

Submission ID	Commenter	Commenter Type
BOEM-2022-0034-0002	James Binder	Individual
BOEM-2022-0034-0003	Jeffrey Tyler	Individual
BOEM-2022-0034-0004	Borough of Seaside Park, Mayor John A Peterson, Jr.	Elected Official
BOEM-2022-0034-0005	Save Long Beach Island, Inc.	Environmental Advocacy and Other Public Interest Groups (NGOs)
BOEM-2022-0034-0006	United States Environmental Protection Agency (EPA)	Federal Agency
BOEM-2022-0034-0008	Kimberly Dreher	Individual
BOEM-2022-0034-0009	Borough of Beach Haven	Local and Regional Agencies
BOEM-2022-0034-0010	The American Waterways Operators	Energy/Non-Energy Industry or Other Associations
BOEM-2022-0034-0011	Twin Lights Historical Society	Individual
BOEM-2022-0034-0012	ECOncrete	Other

Submission ID	Commenter	Commenter Type
BOEM-2022-0034-0013	New England and Mid-Atlantic Fishery Management Councils	Local and Regional Agencies
BOEM-2022-0034-0014	American Saltwater Guides Association	Energy/Non-Energy Industry or Other Associations
BOEM-2022-0034-0015	Seafreeze Shoreside, Seafreeze Ltd.	Other
BOEM-2022-0034-0016	Robert Griffin	Individual
BOEM-2022-0034-0017	Citizens Campaign for the Environment	Environmental Advocacy and Other Public Interest Groups (NGOs)
BOEM-2022-0034-0018	New York Offshore Wind Alliance, Fred Zalcman	Energy/Non-Energy Industry or Other Associations
BOEM-2022-0034-0019	OW Ocean Winds East, LLC	Energy/Non-Energy Industry or Other Associations
BOEM-2022-0034-0020	World Shipping Council	Energy/Non-Energy Industry or Other Associations
BOEM-2022-0034-0021	New Jersey Offshore Wind Coalition	Environmental Advocacy and Other Public Interest Groups (NGOs)
BOEM-2022-0034-0022	Attentive Energy LLC	Energy/Non-Energy Industry or Other Associations
BOEM-2022-0034-0023	Rhode Island Coastal Resources Management Council	State Agency
BOEM-2022-0034-0024	The Nature Conservancy	Environmental Advocacy and Other Public Interest Groups (NGOs)
BOEM-2022-0034-0025	Massachusetts Office of Coastal Zone Management	State Agency
BOEM-2022-0034-0026	Aspen Institute, Esther Sosa, Swathi Manchikanti, Stephen Mushegan	Academic
BOEM-2022-0034-0027	Cape May County, NJ; Point O'Woods Association, Fire Island, NY	Local and Regional Agencies
BOEM-2022-0034-0028	Clean Ocean Action	Environmental Advocacy and Other Public Interest Groups (NGOs)
BOEM-2022-0034-0029	American Clean Power Association	Energy/Non-Energy Industry or Other Associations
BOEM-2022-0034-0030	Invenergy Wind Offshore LLC	Energy/Non-Energy Industry or Other Associations
BOEM-2022-0034-0031	New York State	State Agency
BOEM-2022-0034-0032	National Wildlife Federation et al.	Environmental Advocacy and Other Public Interest Groups (NGOs)
BOEM-2022-0034-0033	Community Offshore Wind	Environmental Advocacy and Other Public Interest Groups (NGOs)
BOEM-2022-0034-0034	Vineyard Offshore LLC	Energy/Non-Energy Industry or Other Associations
BOEM-2022-0034-0035	Responsible Offshore Development Alliance	Energy/Non-Energy Industry or Other Associations
BOEM-2022-0034-0036	Atlantic Shores Offshore Wind, LLC	Energy/Non-Energy Industry or Other Associations
BOEM-2022-0034-0037	New Jersey Department of Environmental Protection (NJDEP)	State Agency

Submission ID	Commenter	Commenter Type
BOEM-2022-0034-0038	Long Island Commercial Fishing Association	Energy/Non-Energy Industry or Other Associations
BOEM-2022-0034-0039	Ted Barten	Individual
BOEM-2022-0034-0040	United States Coast Guard	Federal Agency
BOEM-2022-0034-0041	National Marine Fisheries Services	Federal Agency
BOEM-2022-0034-0042	Fisheries Survival Fund	Environmental Advocacy and Other Public Interest Groups (NGOs)
BOEM-2022-0034-0043	Bluegreen Alliance	Environmental Advocacy and Other Public Interest Groups (NGOs)
BOEM-2022-0034-0044	National Park Service	Federal Agency
BOEM-2022-0034-0045	Wallace & Associates, Anonymous	Energy/Non-Energy Industry or Other Associations

NGO = non-governmental organization

O.1.1 General Comments

General comments are discussed in this section.

O.1.1.1 General Support

One commenter expressed general support for the NY Bight offshore wind project and said that the currently available wind turbine generators (12–14+ megawatts [MW]) coupled with decades of European construction and operating experience allows for competitive pricing and strong capacity factors. The commenter added that successful pilot programs in United States waters (Block Island, Dominion) provide additional supportive data and experience.[1]

O.1.1.2 General Opposition

The commenter expressed opposition to the current location and size of the NY Bight project.[2]

O.1.1.3 Other General Topics

One commenter recommended using the United States Environmental Protection Agency's (EPA's) NEPAssist web-based application tool for the project as well as for future projects to facilitate the environmental review process and aid in project planning. The commenter said that NEPAssist is a useful tool for identifying environmental resources in the area and could indicate potential environmental issues at the earliest stage of project development.[3]

[1] T. Barten.
[2] K. Dreher.
[3] EPA.

O.2 Purpose and Need

Comments associated with the Proposed Action's purpose and need are discussed in this section.

O.2.1 Purpose and Need for Action

Approximately 10 commenters provided feedback on the purpose and need for the Proposed Action.

Several commenters listed the threat climate change poses to the natural environment, including fisheries, as a reason for developing offshore wind in the NY Bight area. The commenters further stated that offshore wind would help achieve the Biden Administration's clean energy goals, for example deploying 30 gigawatts (GW) of offshore wind by 2030.[4]

One commenter expressed support for the purpose of the Proposed Action in the PEIS "to identify, analyze, and adopt, as appropriate, issues, degree of potential impacts, and avoidance, minimization, mitigation, and monitoring (AMMM) measures" but expressed concern that the need is framed within the context of reaching various States' goals for offshore wind generation.[5] A commenter said that deferring to Executive Orders as the "purpose and need" for offshore wind development in the Bight, rather than identifying the scientific need for these projects and how they would fulfil it, demonstrates that BOEM's course of action is already foreclosed. The commenter stated that following a course in such a predetermined way violates the National Environmental Policy Act (NEPA). The commenter stated that rather than relying on Executive Order goals to justify the development in question, the PEIS should include a thorough greenhouse gas emissions analysis for the entire life cycle of these projects, especially with respect to how long it would take for the projects to offset the amount of greenhouse gas emissions that would be required to construct, operate, maintain, and decommission them.[6]

One commenter wrote that the PEIS should clearly explain the rationale for a tiered environmental review process for NY Bight offshore wind development and that both the purpose and need along with the scope of the analysis must be clearly stated for a meaningful review process.[7] Another commenter said that the purpose and need of offshore wind is to provide needed power and to reduce greenhouse gas emissions but that this has already been done or is in the process of happening in the United States. The commenter stated that this fact needs recognition in the PEIS.[8]

O.2.2 Regulatory Jurisdiction/Statutory Authority

Three commenters provided feedback on BOEM's regulatory jurisdiction or statutory authority.

---

[4] Atlantic Shores Offshore Wind, LLC; New Jersey Offshore Wind Coalition; Citizens Campaign for the Environment; R. Griffin; Attentive Energy LLC; Community Offshore Wind.
[5] Responsible Offshore Development Alliance.
[6] Clean Ocean Action.
[7] EPA.
[8] J. Binder.

One commenter disagreed with BOEM making the fulfillment of State renewable energy goals the primary goal of NY Bight development. The commenter said that BOEM's current approach is backwards, stating that it subordinates a federal, statutorily authorized process to State legislation. The commenter stated that the Purpose and Need for the Proposed Action should thus be revised.[9] Contrarily, a commenter said that, in the New York State Public Service Law Article VII review, the New York State Department of Public Service (NYSDPS) would be reviewing the proposed facility design for conformity with criteria adopted by the NYSDPS for electromagnetic field (EMF) levels "at right-of-way (ROW) edge."[10] Another commenter generally stated that BOEM has authority to regulate permitting in the outer continental shelf.[11]

O.2.3 Scope of the PEIS

Approximately 10 commenters listed additional factors that should be included in the scope of the PEIS, including:

- State commitments (project labor agreements [PLAs], prevailing wage standards, monitoring of wildlife, etc.), as they are formative to project development.[12]
- Creation of quality, family-sustaining, union jobs throughout the lifetime of the project.[13]
- Expansion of domestic manufacturing along a robust domestic supply chain.[14]
- Delivery of community benefits with attention to stakeholder engagement.[15]
- Protection of wildlife and marine ecosystems by avoiding, minimizing, mitigating, and monitoring impacts over the course of site assessment and project development, including through the utilization of the best available science and data.[16]
- Inclusion of an impact analysis that is comprehensive, transparent, objective, and quantitative, that accounts for uncertainty and addresses data gaps, considers reasonable alternatives and mitigation, assesses cumulative impacts, and requires monitoring and adaptive management.[17]
- Expansion of the PEIS to include the New Jersey Wind Energy Area (WEA), defined by lease areas Outer Continental Shelf (OCS) A–0498, 0532, A–0499, and A-0549.[18] With this expansion of the PEIS, the commenter said that additional mitigation measures should be discussed, including the

[9] Seafreeze Shoreside, Seafreeze Ltd.
[10] New York State.
[11] Aspen Institute.
[12] Bluegreen Alliance.
[13] Bluegreen Alliance.
[14] Bluegreen Alliance.
[15] Bluegreen Alliance.
[16] Bluegreen Alliance.
[17] National Wildlife Federation et al.
[18] Borough of Beach Haven; Save Long Beach Island, Inc.; Fisheries Survival Fund.

consideration of the project's visible impact on historic properties on Long Beach Island, New Jersey; consideration of the project's impact on the State's coastal zone and its conflicts with the visual resource protection elements of the State's coastal zone management rule; and consideration of the impact of operational turbine noise on fin and humpback whales that frequent the inner part of the project area.[19]

- Expansion of the PEIS to include alternative WEAs.[20]
- Inclusion of substantive programmatic AMMM measures to address issues including the cumulative impacts of construction and operational noise on the migration of the North Atlantic right whale, the cumulative impact of multiple vessel surveys, and the cumulative impact on migratory birds.[21]
- Inclusion of the following items when evaluating impacts on the human environment and on a range of onshore components:[22]
    - The New York State Department of Transportation (NYSDOT) Utility Accommodation Plan.
    - The location of State highway ROW boundaries and road classifications for onshore planning of transmission line siting.
    - Coordination between local, State, and federal partners when transportation planning.
    - Consideration of the siting pathway options for the transmission line location when determining the location of points of interconnection.
    - Acknowledgement of the role of NYSDOT in evaluating transportation as a component of the human environment and involve the New York State transportation real property and engineering experts in all proposals for onshore transmission siting impacting State roads and highways.
    - Adherence to the NYSDOT Standard Specifications when installing utilities within a State highway ROW.
    - Recognition that any proposal to locate a transmission facility within a State highway ROW should minimize impacts on highway use, safety, maintenance, aesthetics, and future highway improvements.
- Consideration of impacts to National Oceanic and Atmospheric Administration (NOAA) trust resources from the full build-out of the six lease areas and a holistic, ecosystem approach to considering AMMM measures to reduce those impacts. This includes fully evaluating interactions among all impact-producing factors and associated responses by marine trust resources,

[19] Save Long Beach Island, Inc.
[20] Save Long Beach Island, Inc.
[21] Save Long Beach Island, Inc.
[22] New York State.

oceanographic and atmospheric processes, and fishing activities across all lease areas within the NY Bight. Specifically, the commenter recommended that the PEIS consider impacts on ocean circulation, citing Department of the Interior guidance. The commenter also added that the PEIS should consider impacts on affected resources and fishery operations at an initial stage and that such consideration will necessitate the development of alternatives to a full build-out of the six lease areas.[23]

- Distinguishing carefully and realistically at the PEIS level between impacts that are "moderate to major" (for which project-specific analysis is required), and those that are "negligible to minor" (for which a programmatic analysis may suffice).[24] Addressing the appropriateness and relative importance of the selected scale against which impacts are being assessed, in terms of both temporal and spatial stressors and receptors.[25]
- Consideration of the lease areas being located in one of the prime hurricane zones in the United States[26]

O.2.4 Other Comments on the Purpose and Need for the Proposed Action

Six commenters provided other comments on the purpose and need for the Proposed Action.

One commenter generally expressed support for the goals and intent of the PEIS process.[27] Another commenter encouraged BOEM to prepare supporting documentation and studies that could quantify the monetary value of cleaner energy sources, good-paying jobs, and historic investments in American energy-supply chains, as well as account for losses that result without full utilization of the lease area in question. The commenter recommended that BOEM incorporate this information into the Purpose and Need of the PEIS.[28]

A commenter expressed concern that BOEM has no intent to disapprove a project or part of a project if its Purpose and Need is to fulfill a developer's power purchase agreement with a utility or to fulfill the nameplate capacity of a project as submitted in the Construction and Operations Plan (COP). The commenter further stated that BOEM must rescind its recent NEPA standardization and conform its process, including the NY Bight PEIS process, to a full consideration of alternatives, including those that might not meet a developer's proposed nameplate capacity or speculative power purchase agreement.[29] Another commenter said that the PEIS should provide a detailed discussion on the goals of the six NY Bight lessees and the renewable energy goals of New York and New Jersey that the six lease areas are designed to serve. The commenter remarked that the applicants' goals form the basis (along with other

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[23] National Marine Fisheries Services.
[24] Fisheries Survival Fund.
[25] The Nature Conservancy.
[26] Borough of Seaside Park.
[27] OW Ocean Winds East, LLC.
[28] Atlantic Shores Offshore Wind, LLC.
[29] Seafreeze Shoreside, Seafreeze Ltd.

factors) for BOEM's Purpose and Need for the Proposed Action and are used as screening criteria for alternatives to be analyzed in detail in a project-specific Environmental Impact Statement (EIS).[30]

One commenter said that BOEM must evaluate the tradeoffs associated with various levels of power generation against the economic and cultural importance of regional fisheries in this PEIS. Pursuing too narrow an analytical approach in this PEIS, the commenter wrote, would predetermine all project parameters and limit the range of possible mitigation measures when a project-specific EIS is conducted, thus resulting in many otherwise appropriate mitigation measures being excluded from consideration at any point in the process.[31] Regarding BOEM's *Process for Identifying Alternatives for Environmental Reviews of Offshore Wind COPs pursuant to the National Environmental Policy Act NEPA*, published in June of 2022, a commenter expressed concern that BOEM changed the wording of a document that would be the basis for the purpose and need for an EIS for any COP.[32]

O.3 Proposed Action and Alternatives

Comments associated with the overall Proposed Action and its alternatives are discussed in this section below.

O.3.1 Proposed Action's Adoption of AMMM Measures for the NY Bight Lease Areas

Approximately 20 commenters listed AMMM measures that they said should be adopted or considered for the NY Bight lease areas, such as:

- Those that incorporate ecological design elements, such as the use of recycled or "environmental concrete," into offshore wind infrastructure as they significantly increase species settlement, richness, and abundance.[33]
- Those that minimize impacts on benthic habitats, pelagic habitats, and fisheries. The commenter stated that benthic habitat impact minimization should remove high value habitat areas, identified by surveys and mapping areas from consideration of development; that pelagic habitat impact minimization analyze an alternative that would consider the impact of the full build-out development along with other proposed offshore wind development in the region on pelagic habitats in the NY Bight, including the Mid-Atlantic Cold Pool; and that fisheries impact minimization should consider consistent wind turbine generator spacing across lease areas to increase the likelihood that fishing can still occur. Also listed were those that coordinate and consolidate routes for export cables, that ensure all export cable routes for interconnections with the grid avoid crossing through estuaries and embayments, that consider all feasible avoidance and minimization measures in the project design and incorporate all available AMMM measures as mandatory

[30] Invenergy Wind Offshore LLC.
[31] Responsible Offshore Development Alliance.
[32] Long Island Commercial Fishing Association.
[33] ECOncrete.

conditions of COP approval, or that incorporate no avoidance and minimization alternatives or AMMM measures.[34]

- Those that primarily avoid negative impacts on valuable fisheries, as opposed to a reliance on mitigation techniques to be employed after lease development.[35]

- Those that first address different options for full build-out and that incorporate up-front avoidance and minimization approaches (e.g., high value habitat that should be avoided). The commenter recommended that these alternatives consider a range of AMMM measures that provide minimal to maximum feasible protection. Further, thorough evaluations of available data on existing resources could help facilitate optimal project design that avoids and minimizes impacts on trust resources throughout the NY Bight while also achieving energy generation goals. The commenter also recommended that the PEIS' Proposed Action be described as the "*full build out* of all six lease areas while incorporating AMMMs" and that mitigation measures be evaluated for their efficacy under each alternative considered by the PEIS.[36]

- Those that create measurable criteria for excluding areas from development when the risk to the physical and human environment exceeds acceptable thresholds, and apply those on regional and project-specific bases in the NY Bight and all regions.[37]

- Those that are technically and commercially feasible, and thus reasonable under NEPA, cautioning that combined AMMM measures should be examined for whether they would cumulatively threaten the viability of projects.[38]

- Those that assess the impacts of project design ranges for each lease area. Further, BOEM should apply this approach for all impact assessments to ensure that the PEIS assessments and AMMM measures capture the reality of the wide range of scenarios.[39]

- Those that include the mitigation considerations identified in BOEM's draft Fisheries Mitigation Guidelines in the PEIS, especially those mitigation guidelines set forth in subparts B (Project Siting, Design, Navigation, and Access) and D (Environmental Monitoring) of the Fisheries Mitigation Guidelines.[40]

- Those that consider larger turbine sizes to reduce windfarm footprints, that complement offshore wind structures with nature inclusive designs to further enhance the artificial reef effect, that

[34] National Marine Fisheries Services.
[35] Fisheries Survival Fund.
[36] National Marine Fisheries Services.
[37] Responsible Offshore Development Alliance.
[38] Vineyard Offshore LLC.
[39] OW Ocean Winds East, LLC.
[40] Fisheries Survival Fund.

ensure the ability of recreational anglers to fish within turbine arrays, and that standardize environmental monitoring across projects.[41]

- Those that incorporate the needs and decision-making of cooperating agencies, that evaluate the effect and effectiveness of programmatic AMMM measures, and that reflect the best available scientific and technological information.[42]

- Those that require an adaptive management plan, whereby if environmental impacts are substantially different than anticipated, operational modifications could be evaluated and executed.[43]

One commenter said that BOEM should refrain from adopting any AMMM measures through this programmatic approach that would jeopardize the Country's ability to address the climate crisis. The commenter suggested that BOEM adhere to its new NEPA alternatives screening criteria in developing the AMMM measures, and recommended that each AMMM measure be technically and economically practical and not undermine any project's future specific purpose and need statements. In particular, the commenter cited a BOEM provision on the prevention of waste and stated that alternatives and AMMM measures should be evaluated based on whether and to what extent they would have foreseeable impacts on the energy generation potential of an offshore wind lease. Furthermore, the commenter stated that BOEM's alternative analysis should exclude project design alternatives and instead focus on the implementation of AMMM measures.[44] A commenter remarked that in order to determine if the subsequent site-specific COPs would have greater, equal, or fewer impacts than those analyzed in the PEIS, it is important that the programmatic AMMM measures provide a metric that allows for a comparison of a project that employs the best practice AMMM measures (lowest impact) and the No Action Alternative (highest impact).[45] Another commenter recommended redefining the Proposed Action to include the development of the lease areas with no AMMM measures and include the implementation of different AMMM measures in other alternatives.[46]

Regarding AMMM measures, one commenter stated that BOEM should focus primarily on moderate or major impacts in individual COPs instead of duplicating analyses in areas that have been determined to cause only minor impacts or no impacts in the EIS.[47] A commenter said that each AMMM measure should be analyzed separately, as individually defined alternatives or sub-alternatives, as well as cumulatively. The commenter wrote that this would allow the public to better understand the impact each measure has on mitigation, particularly if individual projects propose using only a subset of the measures in a COP. Further, the commenter remarked that development of the AMMM measures from the PEIS should serve as a baseline for the minimal level of mitigation expected by a lessee for any

[41] American Saltwater Guides Association.
[42] Invenergy Wind Offshore LLC.
[43] New York State.
[44] American Clean Power Association.
[45] National Wildlife Federation et al.
[46] EPA.
[47] Citizens Campaign for the Environment.

project. Merely adopting the programmatic measures is not expected to be sufficient to remedy the impacts from offshore wind development and should not be viewed as a cap for any mitigation measure, regardless of the scale of the impact: negligible, minor, moderate, or major. The commenter added that a future PEIS should be provided prior to lease auctioning because of the importance of siting to environmental impacts and that future, project-specific alternative analyses should be conducted in EISs rather than environmental assessments. The commenter also expressed disappointment that the PEIS did not include Empire Wind, Atlantic Shores, and Ocean Wind projects; the commenter stated that these projects are in the immediate region and that they should include programmatic AMMM measures similar to any adopted for the NY Bight because of common cumulative impacts.[48]

One commenter stated that BOEM's AMMM analysis should be sufficiently flexible as to avoid foreclosing the use of AMMM measures that may evolve after the PEIS analysis is complete but prior to project implementation, and that would also achieve the same or lesser level and type of impacts. The commenter requested that BOEM ensure that, through consultation with the lessees, the AMMM measures evaluated will be both technically and economically feasible.[49]

A commenter remarked that BOEM should provide clarity in the PEIS on how it would determine whether a particular programmatic AMMM measure applies to a given NY Bight project. The commenter also recommended that BOEM identify required mitigation outcomes and representative examples of approaches that could serve to mitigate project impacts, without mandating specific technologies as programmatic AMMM measures.[50] One commenter expressed concern that BOEM would adopt the current Draft Fisheries Mitigation Guidance document as an AMMM measure in the upcoming NY Bight PEIS as a way to downgrade major fisheries impacts. The commenter stated that this guidance document is procedurally and substantively deficient and referred to its comment on the Draft Fisheries Mitigation Guidance document for further detail.[51] A commenter recommended that BOEM use this PEIS to adopt AMMM measures based on the forthcoming final Guidance for Mitigating Impacts of Offshore Wind Energy Projects on Commercial and Recreational Fisheries.[52] Another commenter expressed concern that the Draft Guidance emphasizes compensation too heavily and that AMMM measures for the NY Bight should be analyzed individually in order to prioritize avoidance of impacts.[53]

O.3.2 Comments on Reasonable Alternatives

Seven commenters recommended alternatives for BOEM or developers to consider or implement in offshore wind development in the NY Bight area, including:

- Alternatives for Manufacturing, Staging, and Assembly

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[48] Responsible Offshore Development Alliance.
[49] Community Offshore Wind.
[50] Attentive Energy LLC.
[51] Seafreeze Shoreside, Seafreeze Ltd.
[52] New England and Mid-Atlantic Fishery Management Councils.
[53] Responsible Offshore Development Alliance.

- Evaluate available alternatives for staging and assembly of offshore wind components including utilizing jack-up barges and platforms in the NY Bight.[54]

- Alternatives for Appurtenant Structures
    - Identify scenarios for co-locating with offshore infrastructure such as existing and future transmission infrastructure, telecommunications, and battery storage projects.[55]
- Alternative Submarine Cable Configurations
    - Evaluate co-locating submarine cables to minimize impacts on sensitive environmental resources, including but not limited to, complex benthic habitats, saltmarshes, and submerged aquatic vegetation (SAV).[56]
- Alternative Turbine Layouts
    - Evaluate a range of turbine layout scenarios to ensure sufficient energy generation and promote co-existence with fishing industries.[57]
- Alternative Habitat Impact Minimization Measures
    - Include a conceptual habitat impact minimization alternative to avoid highly sensitive and significant habitat types and possibly avoidance areas.[58]
- Alternative Construction Methodologies
    - Evaluate alternative offshore installation methodologies that allow simultaneous trenching and cable lay to minimize impacts on water quality and benthic habitat.[59]
- Locating the project in the Hudson South Call Area, which is 30 to 57 miles offshore, where turbines would not be visible.[60]
- Land based alternatives, which the commenter characterized as the most rapid and efficient efforts to achieve energy efficiency, resource conservation, and global warming mitigation, and to prevent the Jersey Shore ocean from becoming a "dumping ground."[61]

One commenter said that an alternatives analysis must consider a pilot project. The commenter stated that a small, local pilot project that uses the proposed technology and could be robustly evaluated

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[54] New York State.
[55] New York State.
[56] New York State.
[57] New York State.
[58] New York State.
[59] New York State.
[60] K. Dreher.
[61] Borough of Seaside Park.

before, during, and after construction is the only way to address shortcomings in the project (e.g., a need for quantitative and qualitative scientific observation, logistical planning, clearance of military hazards) and begin the path toward responsible development of offshore wind energy in the NY Bight waters through a process that reflects fair, responsible, and good governance. The commenter stated that research on the impacts of wind development in regions other than the NY Bight should not be relied upon because of the unique characteristics of the NY Bight. The commenter provided descriptions of conditions in other wind development regions that differ from those of the NY Bight, stating that postponing development in the NY Bight would allow more time to recover unexploded munitions and mustard gas.[62] Similarly, another commenter said that a limited test project alternative must be considered. A test project would facilitate gathering information on benefits and impacts before a large project is implemented.[63]

A commenter requested that BOEM apply the screening criteria for the alternatives described in its 2022 "Process for Identifying Alternatives for Environmental Reviews of Offshore Wind Construction and Operation Plans pursuant to the National Environmental Policy Act (NEPA)" guidance in determining the reasonable range of alternatives for the PEIS. The commenter stated that by defining a reasonable approach to the alternatives analysis, the PEIS could appropriately reflect BOEM's extensive process of analyzing and leasing the WEA, preserve the goals of the applicants who have secured leases based on investment-backed expectation of wind energy output, and identify proposed and alternative AMMM measures that adequately address environmental impacts.[64]

One commenter said that the PEIS should acknowledge and consider the considerable pre-auction reduction in the NY Bight WEAs, given that prior reduction of any alternatives that further significantly reduce site utilization would both be unnecessary and run counter to federal and State clean energy goals. The commenter stated that PEIS alternatives should maximize site utilization in order to preserve project viability and added that BOEM should seek buy-in from other agencies to minimize environmental review work to be conducted after the PEIS stage.[65]

O.3.3 Comments on No Action Alternative

Five commenters provided feedback on the No Action Alternative.

One commenter recommended that BOEM implement the No Action Alternative until all relevant and essential scientific information has been accumulated, thoroughly reviewed, and disseminated to the public.[66]

A commenter said that BOEM's No Action Alternative should acknowledge the unsettling effects of a project denial on cumulative economic benefits due to disruption in supply chain investments.[67] Another

[62] Clean Ocean Action.
[63] J. Binder.
[64] Invenergy Wind Offshore LLC.
[65] OW Ocean Winds East, LLC.
[66] Borough of Seaside Park.
[67] American Clean Power Association.

commenter stated that a robust analysis of the benefits of clean energy should be included in all alternatives and be compared to the impacts (air quality, water quality, etc.) that would flow from fossil fuel use inherent in the No Action Alternative.[68]

One commenter remarked that the No Action Alternative is supposed to serve as a comparative tool for the Proposed Action, but currently allows for little understanding of efficacy of the AMMM measures of the Proposed Action. The commenter recommended redefining the Proposed Action to include the development of the lease areas with no AMMM measures and include the implementation of different AMMM measures in other alternatives.[69] Another commenter said that the PEIS must provide a comprehensive, transparent, and fair analysis of the potential risks and impacts associated with offshore wind energy development activities in the New York and New Jersey Bight, and thus, from the outset, should include an alternatives analysis that contains both a pilot project and a true No Action Alternative.[70]

O.4 Resource and Stressor Topics

Comments associated with individual resources and impacts are discussed this section.

O.4.1 Air Quality

Five commenters provided feedback on air quality issues.

A couple of commenters recommended that the PEIS include National Ambient Air Quality Standards (NAAQS) to better understand the level of air pollutants impacts of wind energy development.[71] Similarly, a few commenters asked that the PEIS consider the impacts of “construction, operation & maintenance, and decommissioning” of wind energy projects on air quality and that these impacts be extensively reviewed as part of the PEIS.[72]

One commenter recommended that preparation of the PEIS include consultation with the EPA and the New York State Department of Environmental Conservation (NYSDEC) in order to include the most accurate information about air quality impacts. The same commenter asked that the environmental impact assessment include an evaluation of changes to air circulation from wind turbines and that the PEIS describe its compliance with federal and State emissions and air quality regulations. They also listed a number of air emission controls for BOEM to consider, including parts per million (ppm) restrictions on diesel generators, ppm restrictions on vessel fuels, and vessel and boiler standards.[73]

Another commenter recommended that the PEIS consider sources of pollution that would impact air quality or violate federal or State ambient air quality standards. The same commenter asked that the

[68] OW Ocean Winds East, LLC.
[69] EPA.
[70] Clean Ocean Action.
[71] New York State; EPA.
[72] Borough of Seaside Park; New York State; EPA.
[73] New York State.

PEIS include options that "explore diesel controls, cleaner fuel and construction practices" or other technology that reduces emissions from wind energy development.[74]

One commenter asserted that BOEM should focus its analysis of the climate benefits of offshore wind development and stated that the benefits from substituting clean energy for fossil fuel generation apply to BOEM's air quality analyses.[75]

O.4.2 Areas of Special Concern

Five commenters provided feedback on areas of special concern.

A couple of commenters discussed a proposal to designate the Hudson Canyon a National Marine Sanctuary. Specifically, one commenter asserted that BOEM should prepare for the impacts of such a designation, especially with possible changes to vessel traffic and fishing activity in the surrounding areas, and account for such changes in the PEIS.[76] Another commenter mentioned the ongoing process of designation and urged BOEM to work with the NOAA, New York and New Jersey, and Tribal Nations to "identify boundaries that avoid overlap with existing wind leases."[77]

One commenter asked that BOEM enforce restrictions on construction and operations of wind energy development on certain areas where migration, spawning events, and other marine processes take place at certain times of the year. The same commenter also asked that BOEM "implement the precautionary principle" for areas of sensitive habitat, spawning areas, and access management areas for fisheries.[78]

One commenter asserted that the PEIS should account for and investigate the impacts on waterways and coastal habitats caused by all stages of wind energy development and went on to cite a number of areas of particular importance, including estuaries in New York and New Jersey and a few Research Reserves.[79]

One commenter discussed both the Holgate Wildlife Refuge and the Forsythe National Wildlife Refuge as areas of particular importance to bird species and criticized the lack of studies on the impact of the proposed project on such refuges.[80]

O.4.3 Avoidance, Minimization, Mitigation, and Monitoring (AMMM) Measures (Including Stipulations)

Approximately 10 commenters offered both general and issue-specific comments on AMMM measures.

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[74] EPA.
[75] American Clean Power Association.
[76] Fisheries Survival Fund.
[77] New Jersey Offshore Wind Coalition.
[78] Responsible Offshore Development Alliance.
[79] Clean Ocean Action.
[80] K. Dreher.

O.4.3.1 General

A couple of commenters urged BOEM to adopt an "adaptive management" framework or process for AMMM measures in order to ensure that these measures can account for technology and information changes.[81] One of the commenters asserted that BOEM should use a "step-wise" approach that considers avoidance of impacts before mitigation and, at last resort, compensation. In the event that compensation is necessary, the commenter recommended that compensation be implemented on a regional scale in order to allow for in-kind and onsite measures to be considered for difficult-to-replace resources. The commenter cited its own guidance as further indicating that offsetting mitigation provisions should be generous to allow for uncertainty in the mitigation's efficacy.[82]

A few commenters debated whether AMMM measures might be more effective on a regional instead of a project-specific level: one commenter stated that BOEM could evaluate at which scale AMMM measures would be more effective,[83] another asserted that compensatory mitigation should be implemented on a regional scale,[84] and another asserted that conducting evaluations of the effectiveness of different AMMM measures could be done on a "project-specific basis."[85]

One commenter encouraged BOEM to support environmental monitoring plans in coordination with federal, State, and industry partners and require data from those plans to be made publicly available.[86] Another commenter asserted that offshore wind should be developed in a manner that is environmentally responsible, mitigates impacts on wildlife, engages involved stakeholders, and continuously monitors impacts on habitats and ocean wildlife.[87] Yet another commenter asserted that AMMM measures will in turn inform COP risk mitigation for addressing important environmental and economic issues during offshore wind development.[88]

A commenter discussed BOEM's intent to focus on impacts from "representative projects" rather than speculation of potential impacts, asserting that this process is a better way to identify AMMM measures.[89]

A commenter listed a number of guidelines for what they believe AMMM measures should look like, such as:

- AMMM measures should be "methodologies, not mandates."

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[81] National Marine Fisheries Services; The Nature Conservancy.
[82] National Marine Fisheries Services.
[83] New York State.
[84] National Marine Fisheries Services.
[85] Community Offshore Wind.
[86] Responsible Offshore Development Alliance.
[87] Bluegreen Alliance.
[88] Aspen Institute.
[89] The Nature Conservancy.

- AMMM measures should be grounded in best available science and best practices informed by developer collaboration and through State and regional initiatives.
- AMMM measures should attempt to support appropriate alternatives and address identified risks, effects, and impacts.
- AMMM measures should attempt to balance efficacy, intent, and safety.

The commenter encouraged BOEM to coordinate with different agencies to design AMMM measures.[90]

One commenter urged BOEM to use the PEIS to "assess the efficacy of AMMMs" and identify other appropriate AMMM measures.[91]

One commenter recommended that BOEM use the PEIS scoping process to inform their mitigation approach, and stated that monitoring and mitigation activities may occur outside of the lease area, especially for species that are highly mobile.[92] Another commenter urged BOEM to require further monitoring for areas in which data is sparse.[93]

O.4.3.2 Issue-Specific

A few commenters discussed AMMM measures specific to construction and operational impacts:

- A commenter encouraged the development of standards regarding foundation design and cable installation to ensure that impacts on protected species are minimized. They also asked that standards for night and low-visibility construction and protocols for coordination between project activities designed to avoid the generation of sound fields and other construction and operational impacts be required, schedules for construction and drilling be adapted to avoid impacts on migratory and time of year dependent species, and that "third-party protected species observers" be required to help implement mitigation and monitoring measures.[94]
- The same commenter also encouraged several monitoring measures related to construction and operation of wind energy development, including monitoring impacts of noise levels during construction, operation, and maintenance; impacts of the physical presence of turbines; and displacement of and changes to fishing activity around the lease areas, among others. They also urged consideration of multiple project designs that can better minimize impacts on important resources, such as changes to foundations and cable burying procedures, and recommended that BOEM develop standards for determining when foundation designs that do not rely on pile-driving

[90] Atlantic Shores Offshore Wind, LLC.
[91] National Marine Fisheries Services.
[92] The Nature Conservancy.
[93] New Jersey Offshore Wind Coalition.
[94] National Marine Fisheries Services.

would be appropriate. Additionally, the commenter recommended that BOEM require routine clean ups of ghost gear and other debris around foundations[95]

- A commenter referenced the "Fisheries Mitigation Guidelines" as a resource to consider for the impacts of wind energy development on the commercial fishing industry. They asserted that AMMM measures should implement standards that integrate closely with these guidelines, such as incorporating design elements that maximize fishery access, reducing space-use conflicts through infrastructure planning, coordination of cable routes and turbine layouts, and other consistent and standardized measures.[96]

- One commenter expressed concern about project development–based cumulative impacts on different species, such as light, noise, and EMF disruptions and recommended that BOEM and other agencies develop monitoring plans in addition to AMMM measures in order to better track such disruptions.[97]

- Another commenter urged close consideration of site design and layout in order to avoid and mitigate impacts on fishing, benthic resources, and more. They also encouraged time of year/day restrictions on construction in order to protect certain species and asked that Horizontal Directional Drilling (HDD) installation methods be reviewed.[98]

- Another commenter urged BOEM to consider changes to offshore wind layout and design as a way of mitigating overlaps with the fishing community. They also listed a number of key measures for fisheries mitigation for BOEM's consideration, such as monitoring fisheries impacts for the life of projects; assessing cumulative impacts of offshore wind on whales and other protected resources through all project phases; conducting species-specific studies for fish stocks that may experience unique impacts; and analyzing impacts of impingement and entrainment, increased water temperature, and larval and juvenile fish mortality.[99]

- A commenter suggested that BOEM include accidental releases and spill mitigation measures and a Spill Prevention, Containment and Countermeasure Plan in the PEIS and urged BOEM to consider spills and accidental releases as long-term issue.[100]

[95] National Marine Fisheries Services.
[96] Fisheries Survival Fund.
[97] National Park Service.
[98] New York State.
[99] Responsible Offshore Development Alliance.
[100] EPA.

A couple of commenters offered AMMM measures specific to the presence of turbines and cables, including vessel strike risks, entanglement concerns, and more:

- One commenter expressed concern about the increased risk of vessel strike from offshore wind development and asserted that reducing all vessel speeds to 10 knots or less could be an effective and even vital mitigation technique for BOEM to consider.[101]
- The same commenter also discussed turbine collision risks for birds and bats and listed some AMMM measures for preventing and mitigating those risks, such as installing collision detection capabilities in turbines, setting turbine height limits, and committing to monitoring collisions to inform how best to avoid them in the future.
- They recommended that BOEM adopt a number of measures to monitor for and mitigate entanglement with turbines and their foundations, including constant monitoring of strain on mooring lines and cables and visual inspection of turbine platforms and cables.
- They also offered some AMMM measures for avoiding the negative impacts of offshore wind cables, including using "jet plow" technology for installation, requiring cable burial during some seasons, avoiding open loop cooling systems due to their negative impact on marine life, and working with fishery managers to better understand adverse impacts on marine life from turbine cables.[102]
- A commenter asserted that BOEM should "avoid routing export cables through estuaries and embayments" due to their being a home for many sensitive habitats and resources. They also listed a number of minimization and mitigation techniques as they apply to cables, including using cable export corridors that avoid important resources, identifying areas that would allow for full cable burial without scour protection, and considering many different project designs that might best minimize the negative impacts of cables.[103]

A couple of commenters discussed AMMM measures for protecting certain species and their habitats:

- A commenter asserted that standards for protected species monitoring should be adopted. They also stated that protocols for addressing unexploded ordnances should be implemented with a focus on avoiding or mitigating exposure to protected species and habitats.[104]
- The same commenter asserted that "compensatory mitigation" should be a requirement for any unavoidable impacts on protected species and their habitats, and that lessees should contribute to this strategy. They also discussed a number of measures for monitoring impacts on important species and habitats, including assessing changes to the seafloor; continuous Passive Acoustic

[101] National Wildlife Federation et al.
[102] National Wildlife Federation et al.
[103] National Marine Fisheries Services.
[104] National Marine Fisheries Services.

Monitoring (PAM) of marine mammals, turtles, and fish; regular oceanographic sampling; and monitoring efforts through the Regional Wildlife Science Collaborative for Offshore Wind (RWSC).[105]

- One commenter asked that BOEM conduct studies specific to species that might experience unique impacts, especially those deemed protected species like whales.[106]

O.4.4 Bats

Two commenters provided comments on issues in the NY Bight PEIS related to bats.

One commenter expressed concerns about behavioral and physiological impacts on bats from offshore wind turbines and asked that the PEIS identify distribution and migration routes, and sonar and echolocation practices. The commenter also recommended that the PEIS examine the Block Island Wind Farm acoustic surveys to better understand the impact of offshore wind construction on bats.[107]

One commenter listed several species of bats found at areas relevant to the NY Bight PEIS, including Gateway and Fire Island National Seashore.[108]

O.4.5 Benthic Resources

Five commenters provided feedback on issues in the NY Bight PEIS related to benthic resources.

A few commenters generally discussed impacts on benthic resources from offshore wind construction and development, including degradation of the seabed, disruptions to the benthic ecosystem, adverse effects on sediment biogeochemistry, and general energy emission impacts, such as those from noise, vibration, and EMFs.[109] One commenter expressed concern about offshore wind development changing how fish species utilize soft-bottomed and nearshore benthic habitat.[110]

One commenter asserted that the PEIS must include a thorough analysis of the impacts of offshore wind development on benthic resources in the area, in part because information about short- and long-term impacts is currently lacking.[111] Another commenter discussed benthic environments around Gateway and Fire Island National Seashore and criticized the fact that the "issue of potential landfall locations for power cables" is not currently addressed in the NOI, and urged BOEM to address it in the PEIS.[112]

A commenter encouraged BOEM to identify benthic resources like important areas for deep water corals as well as existing benthic and shellfish resources. They asked that the PEIS evaluate impacts from excavation and sediment dispersal, as well as disturbance that might be caused by construction and

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[105] National Marine Fisheries Services.
[106] Responsible Offshore Development Alliance.
[107] New York State.
[108] National Park Service.
[109] Fisheries Survival Fund; Clean Ocean Action; National Park Service; New York State.
[110] National Wildlife Federation et al.
[111] Clean Ocean Action.
[112] National Park Service.

other maintenance activities. They also urged the PEIS to "quantify cable and scour protection disturbance areas," evaluate construction monitoring, and generally minimize impacts on benthic habitat. The commenter also recommended that BOEM include "nature-inclusive designs," such as using material alternatives to concrete mattresses.[113]

One commenter asserted that a growing body of research points toward the benthic effects of offshore wind and asked that the PEIS thoroughly consider such impacts.[114]

O.4.6 Birds

Nine commenters provided feedback on issues in the NY Bight PEIS related to birds.

O.4.6.1 Comments on Species

Some commenters generally discussed the abundance of birds in and around the NY Bight area, including but not limited to species of plovers, terns, gulls, shorebirds, waterfowl, hawks, egret, sandpiper, ducks, owls, skimmers, osprey, and more, many of which are considered endangered or threatened.[115] One commenter asserted that there are over 400 different species of birds in New Jersey and 503 species in New York,[116] while another commenter stated that around 333 avian species have been found in the Fire Island National Seashore area and around 326 species have been found in the Jamaica Bay Wildlife Refuge.[117]

A few commenters specifically mentioned the presence of the threatened Piping Plover in the NY Bight area, expressing concern about the effects of wind energy development on that species' survival and wellbeing.[118] One commenter specifically asked that the piping plover receive a review under the Endangered Species Act (ESA).[119] Another commenter stated the importance of the Holgate and Forsythe Wildlife Refuges to the Piping Plover and criticized studies for not showing how the proposed project would affect these refuges.[120]

O.4.6.2 Impacts on Birds

A few commenters expressed general concern for negative impacts on birds, especially migratory species, from wind energy development in the NY Bight area. One commenter asserted that the geographic location and important water resources of the Raritan and Sandy Hook Bays make those areas an important "migratory staging area" for birds on the Atlantic Flyway. The same commenter added that habitats in the Fire Island National Seashore and Jamaica Bay are important resting and

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[113] New York State.
[114] Fisheries Survival Fund.
[115] National Park Service; Clean Ocean Action; New York State; Save Long Beach Island, Inc.; National Wildlife Federation et al.
[116] Clean Ocean Action.
[117] National Park Service.
[118] National Park Service; K. Dreher; Save Long Beach Island, Inc.
[119] Save Long Beach Island, Inc.
[120] K. Dreher.

feeding areas for migratory birds, especially the Piping Plover. [121] A couple of commenters asked that cumulative impacts on bird wildlife and their habitats from wind energy development be reviewed and investigated in the PEIS.[122]

A few commenters expressed concern about mortality risks to birds from collision with turbine blades, disorientation and displacement risk from the lighting of turbines and wind energy stations, and noise disruption from turbines and their blades/general operation.[123] One commenter asserted that the PEIS must identify and review these numerous impacts on birds, as well as identify ways to mitigate and minimize those impacts to the greatest extent possible.[124] Another commenter asked that BOEM consider information from the Block Island Wind Farm post-construction surveys in order to better assess impacts on bird species from wind energy development.[125] One commenter asked about results from studies regarding the environmental impact on birds from proposed development.[126]

One commenter expressed concern about a number of other wind energy development risks to birds, including upticks in prey resources around the turbines, which could lead to more collisions, potential oil and lubricant spills in the ocean, and destruction of habitat in order to make way for onshore substations and port facilities.[127]

One commenter criticized BOEM's use of a 98 percent turbine avoidance rate, asserting that referenced studies supporting that number are not representative of the scale of the Proposed Action in the NY Bight area and that uses of the 98 percent avoidance rate are not supported well enough. They also urged BOEM to do a current assessment of collision and fatality risks and asserted that such a cumulative risk analysis would require the inclusion of the New Jersey wind area in the PEIS.[128]

One commenter asked that BOEM identify "seasonal distribution, aggregation, abundance and migration routes" for birds in the area, specifying sea duck abundance as an important consideration.[129] Another commenter asked that BOEM generally protect avian species in its development of offshore wind.[130]

O.4.7 Climate Change

Approximately 10 commenters provided feedback on climate change as it relates to the NY Bight PEIS.

Some commenters generally addressed the global threat of climate change and how offshore wind development might fit into the process of combating climate change. Specifically, a couple of

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[121] National Park Service.
[122] Borough of Seaside Park; National Wildlife Federation et al.
[123] Clean Ocean Action; New York State; Save Long Beach Island, Inc.
[124] Clean Ocean Action.
[125] New York State.
[126] Twin Lights Historical Society.
[127] Clean Ocean Action.
[128] Save Long Beach Island, Inc.
[129] New York State.
[130] New York Offshore Wind Alliance.

commenters asserted that the swift development of offshore wind projects is needed to address the climate crisis/emergency.[131] One commenter asserted that offshore wind development is "a critical strategy…at the State and federal levels" to counteract reliance on fossil fuel generation,[132] while another called it "one significant part of the antidote" for fighting climate change.[133] Another commenter asserted that wind energy installations would need to be quadrupled by 2030 in order to avoid climate change's worst effects.[134]

One commenter addressed climate change impacts specific to New York, including sea level rise and flooding, damages from major storms like Superstorm Sandy, warmer winters and hotter summers, air and ocean pollution from fossil fuels, and the destruction of certain ecosystems and species, like the 90 percent decline of the lobster species from warmer waters.[135]

A few commenters approached the idea of using offshore wind development to combat climate change with more caution. One commenter professed general support for offshore wind development to combat climate change but cautioned against developing these projects without a greater understanding of their impact on Atlantic coast resources and waters elsewhere.[136] One commenter asserted that, due to expanded use of fossil fuels overseas, the Proposed Action is unlikely to have a large impact on climate change, and that this use of fossil fuels should be considered as "part of Foreseeable Impacts" for each of the environmental issues and scenarios analyzed in the Draft PEIS for the Proposed Action and No Action Alternative. The same commenter also asserted that offshore wind may not be the best way to combat climate change and criticized BOEM's "silo" approach of limiting offshore wind as the only future clean energy projects, stating instead that BOEM should consider more clean onshore development projects and include the evaluation of those projects in the PEIS.[137]

One of the commenters that supported more offshore wind projects cautioned that they have a reciprocal relationship to climate change, meaning that they help to mitigate it but are nonetheless affected by it as well. They criticized BOEM's lack of climate change–related information in its evaluation process and urged BOEM to undergo a systematic process for "a holistic understanding science-based understanding of climate change and how offshore wind energy exists within it."[138] Another commenter that professed their support for offshore wind urged BOEM to weigh the environmental benefits to combat climate change with any negative impacts of offshore wind construction.[139]

[131] Atlantic Shores Offshore Wind, LLC; Attentive Energy LLC.
[132] New York Offshore Wind Alliance.
[133] Citizens Campaign for the Environment.
[134] R. Griffin.
[135] Citizens Campaign for the Environment.
[136] American Saltwater Guides Association.
[137] J. Binder.
[138] R. Griffin.
[139] Citizens Campaign for the Environment.

A couple of commenters asserted that assessments of the climate change benefits from offshore wind should be a key part of the PEIS.[140]

One commenter asked that BOEM assess the Proposed Action's alignment with climate change policies like the Climate Act, consider environmental impacts and habitat changes from the Proposed Action in concert with current and future climate change impacts, and ultimately "evaluate the Net Carbon Footprint" of its Proposed Action. They also urged BOEM to evaluate climate mitigation measures that would help reduce possible climate impacts.[141]

One commenter recommended that the PEIS identify and quantify greenhouse gas emissions associated with the Proposed Action, incorporate an energy substitution analysis, include a discussion on how reductions in greenhouse gas emissions would meet climate goals/commitments, and include as part of the NEPA analysis a discussion of foreseeable effects of future climate change on the Proposed Action and its surrounding area. They also requested that BOEM ensure that offshore wind development does not intrude on the achievement of Comprehensive Conservation and Management Plan goals, especially when considering the impacts of climate change.[142]

O.4.8 Coastal Habitat and Fauna

Two commenters provided feedback on coastal habitat and fauna issues related to the NY Bight PEIS.

One commenter asserted that the PEIS should analyze impacts on a number of listed protected species from offshore wind development affecting coastal habitats and fauna, adding that the cumulative impacts are likely to be significant and that any efforts to minimize and mitigate them should be taken. They also stated that the PEIS should discuss impacts on coastal habitat and fauna from the installation, presence, and eventual decommissioning of transmission cables, something that the Draft EIS did not do.[143]

Another commenter asked that the PEIS "identify Best Management Practices" to reduce impacts on vulnerable habitats, especially ones that may shift from the introduction of new structures and cable installation, evaluate the impacts on terrestrial vegetation, and consider "measures to prevent the spread of invasive species." They also asked that the PEIS evaluate impacts on vegetated dune/beach habitats, Coastal Erosion Hazard Areas (CEHA), and New York State (NYS) Significant Coastal Fish and Wildlife Habitats (SCFWF), providing a link to a list of the latter.[144]

O.4.9 Commercial and For-Hire Recreational Fishing

Approximately 15 commenters provided feedback on commercial and for-hire recreational fishing issues related to the NY Bight PEIS.

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[140] OW Ocean Winds East, LLC; American Clean Power Association.
[141] New York State.
[142] EPA.
[143] Clean Ocean Action.
[144] New York State.

O.4.9.1 General Impacts

A few commenters addressed the extent to which commercial and recreational fishermen and fisheries operate in and around the NY Bight proposed lease areas and would be affected by the proposed rule. One commenter asserted that the PEIS should account for not only lease areas within NY Bight but also areas leased in the Southern New England area and all the way down to North Carolina, given that commercial fishermen operate all throughout those areas.[145] Another commenter expressed concern about the effect of the construction, operation, and decommissioning of WEAs on Rhode Island commercial and charter fisheries.[146] Similarly, a commenter expressed concern about cumulative impacts on the Massachusetts fishing industry as more offshore wind projects are built on the coast.[147] One commenter asserted that the NY Bight is "one of the most important regions for both commercial and recreational fisheries on the East Coast" and referenced past comments they left on BOEM Calls for Interest and Proposed Sale Notices, asking BOEM to include any and all included fisheries information in the PEIS.[148] One commenter asserted that offshore wind development must "[safeguard] the abundance and diversity of the area's rich fisheries."[149]

One commenter referenced a number of figures showing overlap between the NY Bight leases and important fishing grounds and asked that BOEM consider their "Fisheries Mitigation Guidelines" in the PEIS in order to better develop impact minimization and mitigation standards.[150]

Some commenters echoed this concern about the impact of offshore wind development on the commercial and recreational fishing industries and generally urged BOEM to include an analysis and evaluation of cumulative impacts on fisheries and the fishing industry in its PEIS.[151] Specifically, one commenter recommended that the PEIS characterize the extent of Massachusetts fishing within the NY Bight area and evaluate potential impacts on key fishing species and thus the industry as a whole.[152] Another commenter asked that BOEM develop criteria for identifying "high-value fishing grounds" in order to better evaluate commercial fishing losses from offshore wind build-out.[153]

One commenter criticized BOEM for "deficient" previous actions on fisheries impacts and asserted that a cumulative analysis of impacts should be done on a fishery-by-fishery basis all down the coast, not simply in the NY Bight area.[154]

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[145] Long Island Commercial Fishing Association.
[146] Rhode Island Coastal Resources Management Council.
[147] Massachusetts Office of Coastal Zone Management.
[148] National Marine Fisheries Services.
[149] New York Offshore Wind Alliance.
[150] Fisheries Survival Fund.
[151] Massachusetts Office of Coastal Zone Management; Responsible Offshore Development Alliance; Long Island Commercial Fishing Association; Borough of Seaside Park; Clean Ocean Action; Rhode Island Coastal Resources Management Council; K. Dreher.
[152] Massachusetts Office of Coastal Zone Management.
[153] Responsible Offshore Development Alliance.
[154] Seafreeze Shoreside, Seafreeze Ltd.

O.4.9.2 Specific Impacts

A few commenters stressed the importance of assessing cumulative economic impacts on the commercial fishing industry from offshore wind development, given the family-owned, community-dependent basis of many of those industries.[155] The latter commenter also stated the importance of including impacts on the recreational fishing industry, given the interconnected nature of the fishing economy off the Atlantic coast. They went on to discuss methods of analyzing economic impacts on the fishing industry, asserting that Vessel Monitoring Systems (VMS) and National Marine Fisheries Service (NMFS) data on fishing boat tracking and fish returns could best approximate catch rates and could then be used to track economic impacts of offshore wind development on the fishing industry.[156]

Similarly, one commenter stated that “spatially explicit catch and effort information” is severely lacking for the recreational fishing sector and thus is a data gap the PEIS needs to consider. They referenced survey and data mining work done by the New England Aquarium’s Anderson-Cabot Center for Ocean Life as a possible blueprint for gathering future data for the PEIS.[157]

One commenter asked that BOEM “separate the analysis of commercial and recreational fisheries.”[158]

One commenter expressed concern about commercial fishing losses as a result of changes in primary productivity from offshore wind development and added that the PEIS should incorporate these impacts into environmental and socioeconomic analysis, as well as the overall cumulative impacts analysis.[159]

One commenter discussed a number of impacts on commercial and recreational fishing, including displacement from typical fishing areas due to offshore wind development, potential gear loss, increased navigation time to avoid offshore wind infrastructure, and general safety concerns, asking BOEM to evaluate all of these potential impacts in the PEIS.[160]

O.4.9.3 AMMM Measures/Compensation

A few commenters generally asked that the PEIS identify AMMM measures for impacts to the commercial and recreational fishing industries.[161]

Another commenter cautioned about conflicts with fishing gear as a result of offshore wind development and stated that cable burial depth should be evaluated as a potential mitigation technique.[162]

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[155] Long Island Commercial Fishing Association; Clean Ocean Action; New York State.
[156] Clean Ocean Action.
[157] American Saltwater Guides Association.
[158] T. Barten.
[159] Seafreeze Shoreside, Seafreeze Ltd.
[160] New York State.
[161] Responsible Offshore Development Alliance; Fisheries Survival Fund; Massachusetts Office of Coastal Zone Management.
[162] New York State.

One commenter listed a number of mitigation and compensation measures for BOEM's consideration, including measures to offset costs of supporting infrastructure, a standardized process for gear loss claims, and a "full, transparent, equitable, and science-based compensation program." They also recommended the establishment of a federal fisheries working group to manage and produce mitigation frameworks.[163] Another commenter added that part of the cumulative analysis should include financial mitigation to fishermen who were not included in the federal review process.[164]

Refer to Section O.4.3, *Avoidance, Minimization, Mitigation, and Monitoring (AMMM) Measures (including stipulations),* for more details on specific AMMM measures.

O.4.9.4 Collaboration

A commenter professed support for a PEIS, asserting that it would help streamline consistency between different offshore wind projects and could allow cumulative impacts to be evaluated early in the process.[165]

One commenter asked that the PEIS outline a fisheries research plan to improve coordination between developers and stakeholders.[166] Another commenter asked that BOEM require developers to "co-develop cooperative monitoring and research plans" with the fishing industry and themselves partner with the fishing industry to provide a centralized "information depository" accessible to fishermen.[167] One commenter encouraged BOEM to continue conversations with the fishing industry about gear adaptations so that they can continue fishing throughout certain times of the year.[168]

O.4.10 Cultural Resources

Four commenters provided feedback on cultural resources issues related to the NY Bight PEIS.

A commenter warned that the anchoring, cabling, and use of chains involved in offshore wind energy development could substantially impact cultural resources in the NY Bight such as submerged shipwrecks. This commenter further recommended that BOEM's PEIS analyze these resources, the potential impacts of offshore wind development on them, and potential mitigation measures, adding that Indian Tribes should be involved in the identification of cultural resources.[169] Similarly, another commenter suggested that offshore wind development be planned with sensitivity to historic and cultural heritage of northeastern Tribal Nations.[170]

A commenter suggested an alternative to BOEM's current guidelines for geophysical surveys with respect to potential impacts on marine archeological resources, arguing that allowing lessees to first

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[163] Responsible Offshore Development Alliance.
[164] Long Island Commercial Fishing Association.
[165] New England and Mid-Atlantic Fishery Management Councils.
[166] Massachusetts Office of Coastal Zone Management.
[167] Responsible Offshore Development Alliance.
[168] New York State.
[169] Clean Ocean Action.
[170] New York Offshore Wind Alliance.

conduct surveys at wider intervals to identify larger shipwrecks and submerged landscape features, with closer interval surveys to be conducted later within the final project footprint to identify smaller, buried marine cultural resources. The commenter further recommended that BOEM analyze approaches to avoid, minimize, and mitigate impacts on these resources.[171]

A commenter said that there are ongoing conservation initiatives in the NY Bight, including the designation process for the Hudson Canyon National Marine Sanctuary to protect cultural resources.[172]

O.4.11 Cumulative Impacts

Approximately 15 commenters provided feedback on cumulative impacts relevant to the NY Bight PEIS.

O.4.11.1 General Comments on Cumulative Impacts

A commenter warned that the cumulative impacts of offshore wind energy development in the NY Bight would be substantial.[173] Another commenter said that BOEM's PEIS should include a fair and full consideration of potential cumulative impacts of offshore wind development in the NY Bight.[174]

A commenter said that BOEM should ensure that efforts are made to avoid, minimize, and mitigate potential cumulative impacts.[175] Similarly, another commenter recommended that where potential cumulative impacts are identified, BOEM should clarify which parties should be responsible for avoiding, minimizing, and mitigating those impacts.[176]

A commenter argued that by assessing cumulative impacts and mitigation measures, BOEM may be able to identify preferrable alternative actions.[177]

O.4.11.2 Cumulative Impacts on Fisheries and Fishing

A commenter expressed support for BOEM's plan to include a PEIS in its rulemaking process, which the commenter claimed appears to be in response to the fishing industry's requests to better assess the cumulative effects of offshore wind development on fisheries.[178] Similarly, another commenter expressed support for BOEM's proposed programmatic approach, claiming that the need for cumulative impacts analyses has been posited by fishery stakeholders and scientists, and that such an approach facilitates stakeholders, such as for-hire captains and private anglers, sharing their input.[179]

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[171] Attentive Energy LLC.
[172] National Wildlife Federation et al.
[173] Wallace & Associates.
[174] Clean Ocean Action.
[175] Clean Ocean Action.
[176] Environmental Protection Agency.
[177] National Wildlife Federation et al.
[178] Responsible Offshore Development Alliance.
[179] American Saltwater Guides Association.

A commenter recommended that BOEM's PEIS articulate how cumulative impacts are considered and incorporated on a project-by-project basis and on an industry-wide scale, identify funding mechanisms and interagency collaborations, and describe mechanisms for mitigating potential fishery collapse.[180]

A couple of commenters recommended that BOEM's PEIS include an analysis of cumulative impacts on fishing operations, such as changes to time and area fished, displaced fishing effort, gear used, stresses on fisheries, and landing ports.[181]

A commenter recommended that BOEM's cumulative analysis assess economic impacts on fishermen from New York who suffered because the State did not file for federal consistency review, as well as include a revamping of NOAA's regional geographic location definition process so that all qualified regional coastal states could automatically qualify if they can prove income from relevant landings. This commenter additionally recommended that the cumulative analysis consider financial mitigation schemes that could be designed for fishermen who were not included during the federal consistency review process.[182]

Multiple commenters recommended that BOEM's cumulative analysis, with respect to impacts on fisheries, be conducted coastwide and fishery-by-fishery and take into account the impacts of existing and foreseeable future offshore wind leases, rather than only on a project-by-project basis.[183] Another commenter echoed this argument and further suggested that in its analysis, BOEM include a description of the potentially impacted resources, current trends regarding the resources, and a discussion of likely future conditions of the resources based on current conditions, trends, and foreseeable projects.[184]

O.4.11.3 Cumulative Impacts on Wildlife

A commenter said that assessing cumulative impacts, through BOEM's PEIS, is essential to understanding the overall impacts of offshore wind development on species and ecosystems, including the effects of noise and the timing of construction.[185]

Multiple commenters recommended that BOEM's PEIS include an analysis of cumulative impacts on endangered species, particularly the effects of noise. [186] Another commenter specified their concern for cumulative impacts on the North Atlantic right whale and key benthic species, claiming that there is insufficient scientific understanding of offshore wind energy development's effects on these species. [187]

[180] Massachusetts Office of Coastal Zone Management.
[181] Rhode Island Coastal Resources Management Council; New York State.
[182] Long Island Commercial Fishing Association.
[183] Seafreeze Shoreside, Seafreeze Ltd.; New England and Mid-Atlantic Fishery Management Councils; American Saltwater Guides Association; Rhode Island Coastal Resources Management Council; New York State.
[184] Environmental Protection Agency.
[185] National Wildlife Federation et al.
[186] Environmental Protection Agency; Rhode Island Coastal Resources Management Council.
[187] Clean Ocean Action.

A commenter recommended that BOEM's cumulative impacts analysis consider effects on habitats, avian and marine mammal migratory pathways, and other ecological processes.[188]

O.4.11.4 Geophysical and Hydrodynamic Cumulative Impacts

A commenter expressed support for BOEM conducting cumulative impact analyses for the rule, particularly with regard to major oceanographic features such as the Mid-Atlantic Bight Cold Pool, which the commenter claimed is especially important for the regional benthic ecosystem and may be particularly susceptible to changes in hydrodynamics caused by wind farm structures.[189]

A commenter also suggested that the PEIS include an analysis of the potential cumulative impacts on sediment biogeochemistry from the increased volume of fecal pellets from fouling fauna and biomass falling from turbine reef structures, which lead to increases in mineralization activity, sedimentary oxygen consumption, and consequently carbon dioxide levels.[190]

Another commenter recommended that BOEM require permits for geological and geophysical surveys and conduct cumulative analyses for such permits.[191]

O.4.11.5 Other Comments on Cumulative Impacts

A commenter recommended that BOEM's PEIS include an analysis of offshore wind development's potential cumulative impacts on marine commerce.[192]

A commenter recommended that BOEM's PEIS include an analysis of the potential cumulative impacts of noise on residential and commercial buildings near port facilities.[193]

A couple of commenters recommended that BOEM consider increased vessel traffic and consequent navigational hazards in its cumulative impacts analysis.[194]

A commenter warned that offshore wind development would have cumulative adverse visual impacts on historic properties, sites, and districts listed or eligible for listing in the National Register of Historic Places, adding that because of the historic integrity of properties within the project area, and the precedent set by this rulemaking for future offshore wind development, it is important that the PEIS is complete and thorough.[195]

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[188] New York State.
[189] Fisheries Survival Fund.
[190] Clean Ocean Action.
[191] Responsible Offshore Development Alliance.
[192] Environmental Protection Agency.
[193] Environmental Protection Agency.
[194] Rhode Island Coastal Resources Management Council; New York State.
[195] Cape May County, NJ; Point O'Woods Association, Fire Island, NY.

A commenter recommended that BOEM's PEIS identify the temporal and spatial criteria necessary for its regional cumulative analysis.[196]

A commenter argued that BOEM's interpretation and tiering of the NEPA review process, as well as the bifurcation of nearby projects like Ocean Wind, Atlantic Shores, and Empire Wind, has obscured the cumulative impacts of offshore wind development. The commenter further requested clarification of the notice's claim that the PEIS will allow BOEM to address "tiering of project-specific environmental analyses."[197]

A commenter recommended that BOEM's cumulative impacts analysis consider effects on sand mining and planned resilience projects.[198]

Refer to the relevant resource sections throughout this appendix for more expansive summaries of the above topics not relating to cumulative impacts.

O.4.12 Demographics, Employment, and Economics

Approximately 10 commenters provided feedback on demographics, employment, and economics issues related to the NY Bight PEIS.

O.4.12.1 Positive Impacts on Demographics, Employment, and Economics

A commenter claimed that this initiative would help meet the Administration's, New Jersey's, and New York's clean energy goals while creating economic opportunity and tens of thousands of jobs.[199] Similarly, another commenter estimated that the development and construction of 16.5 GW of offshore wind energy off the coasts of New York and New Jersey could directly or indirectly support approximately 50,000 jobs, and that nationally reaching 30 GW by 2030 would create 83,000 jobs. This commenter further argued that BOEM has underestimated the economic benefits of offshore wind development in its past NEPA analyses by focusing on the effects on the local area and not including regional and national supply chain and economic effects, adding that project approvals in a young industry can have ripple growth effects across that industry's supply chain. Finally, the commenter said that to deny the project would have the opposite effect, disrupting supply chain investments in the wind energy industry.[200]

A commenter cited a study to claim that requiring developers to use 100 percent domestic content inputs versus 25 percent domestic content could result in a difference of 30,000–40,000 jobs created from 2023–2030.[201]

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[196] Clean Ocean Action.
[197] Clean Ocean Action.
[198] New York State.
[199] OW Ocean Winds East, LLC.
[200] American Clean Power Association.
[201] Bluegreen Alliance.

A commenter said that this initiative would help reduce greenhouse gas emissions and create a robust domestic offshore wind manufacturing sector.[202]

O.4.12.2 Negative Impacts on Demographics, Employment, and Economics

A commenter argued that given the size and visibility of the proposed project, it could cause losses of tourism revenue of up to $300 million per year, nearby property value losses ranging from $1 million to $189,000 per home, an approximately 55 percent reduction in area vacation rentals, and job losses in the hospitality sector.[203]

A commenter claimed that based on figures published by the New Jersey Board of Public Utilities, the planned developments would cause electric rates to increase in the State, with residential rates increasing 10 percent, commercial rates 15 percent, and industrial sector rates 18 eighteen, which could cause job losses. This commenter further claimed that many of the jobs the projects would create are temporary and that it is unclear how many would be held by U.S. workers.[204] Similarly, another commenter claimed that wind turbines are largely manufactured outside of the United States, which does not benefit U.S. employment.[205]

O.4.12.3 Recommendations with Respect to Demographics, Employment, and Economics

A commenter recommended that BOEM require developers to report investments in workforce training and supply chain development.[206]

A commenter suggested that BOEM consider changes that have occurred since it issued its Programmatic EIS for Alternative Energy Development in 2007 with respect to the economics of offshore wind, including: the automation of the operation and maintenance of offshore wind energy systems, which reduces potential for job creation; the relative costs of offshore wind energy and other clean energy technologies; and the reliability of wind energy in general.[207]

A commenter recommended that BOEM's PEIS include a socioeconomic impact analysis that considers electric rates and lost tourism and the offsetting benefits in terms of reduced emissions.[208]

A couple of commenters recommended that BOEM consider impacts on regional fisheries, potential lost jobs and income among commercial fishermen and recreational for-hire fishing, and higher costs to the seafood industry in general.[209]

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[202] New York Offshore Wind Alliance.
[203] K. Dreher.
[204] Save Long Beach Island, Inc.
[205] J. Binder.
[206] Aspen Institute.
[207] J. Binder.
[208] Save Long Beach Island, Inc.
[209] Responsible Offshore Development Alliance; Clean Ocean Action.

A commenter made numerous recommendations with respect to the rule's potential economic effects, including that BOEM:

- Require compensatory mitigation for fishermen for the life of the project and establish adequate reserve funds for that purpose by establishing a compensation program paid into by lessees.
- Honor compensation claims for up to 3 years after income loss, per review by fisheries experts.
- Conduct transparent impact analyses with respect to energy, economics, employment, and greenhouse gas emissions for regions and specific projects.[210]

Another commenter also made numerous recommendations with respect to the rule's potential economic effects, including that BOEM:

- Assess potentially higher costs for offshore wind energy.
- Present comprehensive mitigation and compensatory measures for unavoidable impacts.
- Clearly communicate the costs of development including siting, preconstruction, construction, operations, maintenance, and decommissioning.
- Provide information about cost protections to electricity ratepayers for potentially higher energy costs.[211]

Another commenter also made numerous recommendations with respect to the rule's potential economic effects, including that BOEM:

- Identify potential impacts on shore-based and water-dependent industries and potentially restricted port access due to increased vessel traffic and construction.
- Assess impacts on public services, populations, economy, employment, housing and property values, the reliability of electric facilities, and public safety.
- Evaluate conformity with United States Coast Guard (USCG) Marine Planning Guidelines.[212]

In order to maximize union job creation and comply with NEPA, a commenter recommended that BOEM's PEIS consider and evaluate: domestic content commitments; project labor, labor peace, and community benefits agreements; utilization of registered apprentices; protections against worker misclassification and wage theft; impacts on fisheries, in consultation with industry stakeholders; equitable access to benefits for historically underserved communities; quantity and quality of jobs created; plans to support the growth of a domestic supply chain to maximize U.S. employment; and programs necessary for expanding the domestic workforce with an emphasis on ensuring opportunities

[210] Responsible Offshore Development Alliance.
[211] Clean Ocean Action.
[212] New York State.

for displaced energy workers. This commenter further argued that using PLAs can help avoid labor disputes, increase project efficiency, improve safety, and create opportunities for historically marginalized communities.[213]

Refer to Section O.4.9 for additional comments on commercial and for-hire recreational fishing, Section O.4.19 for additional comments on navigation and vessel traffic, and Section O.4.23 for additional comments on recreation and tourism not relating to demographics, employment, and economics.

O.4.13 Environmental Justice

Nine commenters provided feedback on environmental justice issues related to the NY Bight PEIS.

O.4.13.1 Environmental Justice Benefits

A commenter stated that offshore wind development could create environmental justice benefits.[214] Another commenter concurred and specified that these benefits could include reducing the environmental and public health burden of fossil fuel generation on frontline communities.[215]

O.4.13.2 Environmental Justice Concerns

A commenter claimed that the impacts of offshore wind development they foresee, including noise, light pollution, air emissions from vessels, reduced access to coastal areas, loss of wetlands, loss of employment in marine industries, and increased stormwater runoff from new parking lots and roads, would be amplified for environmental justice communities.[216]

A commenter warned that people who live and invest in nearby ocean communities would be negatively impacted by this rule, with the quality of the ocean degrading, European developers earning money at their expense, and local livelihoods declining.[217]

O.4.13.3 Process Recommendations for Achieving Environmental Justice

Several commenters recommended that BOEM consider issues of environmental justice in this rulemaking process.[218] More specifically, a commenter recommended that BOEM incorporate environmental justice concerns raised in New York's Climate Act, consider impacts on disadvantaged communities (DACs) and potential mitigation measures for those impacts, and analyze increased air emissions and other impacts in Potential Environmental Justice Areas.[219] Another commenter recommended that BOEM use EPA's Environmental Justice Screening and Mapping Tool to consider

[213] Bluegreen Alliance.
[214] American Clean Power Association.
[215] New York Offshore Wind Alliance.
[216] Clean Ocean Action.
[217] Wallace & Associates.
[218] Mayor John A Peterson, Jr.; OW Ocean Winds East, LLC.
[219] New York State.

possible impacts on vulnerable adjacent communities; and noise, air, lighting, and traffic impacts from construction and project operations on populations surrounding facilities.[220]

A commenter claimed that they identified DAC representatives from New York and New Jersey who desired earlier engagement in the present rulemaking process, in addition to increased transparency and accountability. By engaging these stakeholders later in the process, this commenter reasoned, their ability to provide valuable feedback is limited because they have had limited exposure to the process. This commenter further recommended that BOEM hold at least one roundtable with DAC stakeholders during the preparation of the PEIS; use these meetings as opportunities to educate DACs on the leasing process, explain the role of the PEIS in the process, identify key concerns and recommendations from DACs, and help build the capacity of DACs to engage overall; share these meetings' agendas, attendance rosters, and summaries of recommendations; and require developers to track and report percentage of the benefits of investments in workforce training and supply chain development going to DACs, which would facilitate understanding how offshore wind development affects DACs and encourage developers to more intentionally consider how DACs are affected by development. Finally, this commenter suggested that BOEM can find sample guidance for such investment monitoring benchmarks from New York State Energy Research & Development Authority's (NYSERDA) 2022 Offshore Wind Solicitation, under which bidders must present their own monitoring framework and ensure that it is verified by a third party. [221]

A commenter requested that if BOEM believes that the closure or displacement of fossil fuel facilities is beneficial for nearby communities and that this will occur if offshore wind energy is developed in the area, that the PEIS present evidence supporting these positions.[222]

O.4.14 ESA-Listed Species

Five commenters provided feedback on the NY Bight PEIS related to ESA-listed species.

O.4.14.1 Potential Impacts on Endangered Species and Mitigation Measures

A commenter stated that the NY Bight is used by a number of species listed under the ESA, including fish, sea turtles, and marine mammals.[223] This commenter further recommended that BOEM monitor protected species during wind farm construction and analyze and develop approaches to construction that will minimize impacts on protected species, particularly with regard to reducing noise from pile-driving, dealing with unexploded ordinances, managing vessel traffic at night and in low visibility conditions, avoiding construction during sensitive times of the year, requiring practices to minimize entanglement, mandating routine cleanups, and choosing cable installation methods that minimize impacts. The commenter also recommended that BOEM require adherence to best management practices to limit capture, entanglement, injury, and mortality of protected species in biological surveys

[220] Environmental Protection Agency.
[221] Aspen Institute.
[222] Clean Ocean Action.
[223] National Marine Fisheries Services.

and that protected species do not interact with gear such as anchor and buoy lines. Additionally, the commenter recommended that dredging activities be subject to seasonal restrictions based on dredge types and possible risks to listed species.[224]

A commenter warned that increased vessel activity and noise from offshore wind development in the NY Bight would be an existential threat to the endangered North Atlantic right whale, of which the commenter claimed only 336 remain. This commenter further recommended that no construction or other offshore wind activity be allowed in the NY Bight during the whale's most sensitive times of the year, including migration periods.[225] Another commenter similarly expressed concern for the project's potential impacts on North Atlantic right whales, adding that they are a particularly valuable and beautiful species.[226] Refer to Section O.4.18 for additional comments on marine mammals.

A commenter recommended that BOEM evaluate year-round northern long-eared bat activity in the vicinity of the proposed action and potential impacts on the species, including tree clearing during construction.[227]

O.4.14.2 Other Process Recommendations with Respect to Endangered Species

A commenter recommended that BOEM identify surveys for rare, threatened, and endangered species along all considered project routes; assess potential impacts on those species along those routes; and consider avoidance, minimization, and mitigation measures with respect to those potential impacts.[228]

A commenter recommended that BOEM consult with the United States Fish and Wildlife Service (USFWS) on potential impacts on aquatic and terrestrial species, in accordance with Section 7 of the ESA.[229]

O.4.15 Finfish, Invertebrates, and Essential Fish Habitat

Eight commenters provided feedback on finish, invertebrates, and essential fish habitat issues related to the NY Bight PEIS.

A commenter requested that BOEM include a consideration of fish habitats as part of its rulemaking process and warned that effects on them from offshore wind development in the NY Bight could be significant.[230] Another commenter requested information about studies of offshore wind development's

[224] National Marine Fisheries Services.
[225] Clean Ocean Action.
[226] Mayor John A Peterson, Jr.
[227] New York State.
[228] New York State.
[229] Environmental Protection Agency.
[230] Mayor John A Peterson, Jr.

effects on fish.[231] Another commenter argued that not enough data is available to fully understand the effects of offshore wind development on finfish and invertebrates.[232]

A commenter claimed that areas of the NY Bight are designated as essential fish habitat for nearly every life-stage of every species managed by the New England and Mid-Atlantic Fishery Management Councils and NMFS, as well as many managed by the South Atlantic Fishery Management Council.[233]

A commenter recommended that BOEM identify current stock status for different species of fish and invertebrates, as well as migration routes, life history stages, and egg and larval seasonality and abundance. This commenter further recommended that BOEM identify essential fish habitat, including spawning, recruitment, and nursery areas, as well as food web interactions. [234]

A commenter claimed that the NY Bight is home to and essential habitat for numerous species, including sea scallops, Atlantic surf clams, ocean quahogs, longfin squid, Atlantic cod, black sea bass, blue fish, and summer flounder.[235] Similarly, another commenter expressed particular concern for sea scallop, surf clam, and ocean quahog populations in and around the NY Bight, which the commenter claimed are particularly important for the seafood industry, and suggested that BOEM designate additional funding for research on potential mitigation measures to protect these species from any possible impacts from offshore wind development.[236]

Several commenters warned that many features or potential accidents arising from offshore wind development could impact finfish, invertebrates, and essential fish habitat, including mid-water structures, noise, EMFs, construction, pile-driving, vessel traffic, foundation lighting, thermal discharges, and oil or other lubricants spills, and that BOEM should analyze the potential impacts of these factors. [237] One of these commenters further warned that such factors could cause changes in migration routes and migratory behavior of migratory fish species, as well as potentially altering local and regional hydrodynamics, which could impact fish and invertebrate settlement, recruitment, and connectivity.[238]

A commenter recommended that BOEM expand NMFS's role in project monitoring and essential fish habitat consultations, as well as giving greater deference to its expertise in these areas.[239] Another commenter recommended that BOEM work with NOAA, State governments, and Tribal Nations to designate marine sanctuaries in the NY Bight.[240]

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[231] Twin Lights Historical Society.
[232] Clean Ocean Action.
[233] National Marine Fisheries Services.
[234] New York State.
[235] Clean Ocean Action.
[236] NJDEP.
[237] National Wildlife Federation et al.; New York State; Clean Ocean Action.
[238] National Wildlife Federation et al.
[239] Responsible Offshore Development Alliance.
[240] National Wildlife Federation et al.

O.4.16 Geological, Geophysical, and Biological Bathymetric Conditions

One commenter provided several recommendations for BOEM regarding geological, geophysical, and biological bathymetric conditions, including that BOEM should:

- Identify sediment quality, type and chemistry within lease areas and along potential cable corridors.
- Evaluate micro-gyres and circulation changes around structures to evaluate scouring and sedimentation from turbine bases and cables and effects on cable burial from coastal processes and storms.
- Evaluate air circulation changes from turbines and sea surface temperature impacts to assess seafloor disturbances from turbine structures and cables.
- Assess seafloor disturbances from construction methodologies such as anchoring, dredging, and seafloor leveling.
- Evaluate cable burial depths necessary to avoid EMF impacts, conflicts with fishing gear, and anchor strikes.
- Evaluate habitat changes from turbine and cable installation, including boulder relocation and seafloor leveling.[241]

O.4.17 Land Use and Coastal Infrastructure

Four commenters provided feedback on land use and coastal infrastructure issues related to the NY Bight PEIS.

A commenter claimed that there is insufficient scientific data on the effects of the construction of the necessary supporting infrastructure for offshore wind energy development.[242]

A commenter warned that this initiative could cause substantial onshore land use impacts from land disturbance, port utilization, cabling routes, and transmission infrastructure, as well as new port areas, parking lots, and structures. This commenter further recommended that BOEM's PEIS estimate the total onshore acreage required for construction, manufacturing, assembly, transportation, operations, and maintenance, as well as disclose rezoning and reclassification and requirements. This commenter added that onshore land disturbance could have effects on stormwater collection and management, and consequently the PEIS should consider this effect in flood-prone areas. Additionally, the commenter recommended that the PEIS evaluate impacts from the use of pesticides, herbicides, and other chemicals in onshore project areas, and that BOEM should require green infrastructure methods in

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[241] New York State.
[242] Mayor John A Peterson, Jr.

project development. Finally, the commenter warned that the developments could impact wetlands in the region.[243]

A commenter provided several recommendations for BOEM regarding land use and coastal infrastructure, including that BOEM:

- Evaluate potential temporary and permanent impacts on land use from siting new infrastructure, including docks, piers, and shoreline stabilization.
- Evaluate potential impacts on vegetated dune and beach habitats; consider impacts on CEHA.
- Avoid disturbing sand borrow areas and beach nourishment activities.
- Provide details on how environmental impacts from operational, maintenance, and port facilities will be analyzed.
- Consider the existing capacity or need for additional capacity of onshore cable for accepting additional power.[244]

A commenter suggested that BOEM adopt as a goal the improvement land use planning to protect soil function, water quality, water supply, and living resources.[245]

O.4.18 Marine Mammals

Approximately 10 commenters provided feedback on issues related to marine mammals in the NY Bight PEIS.

A couple of commenters claimed that the NY Bight is home to numerous species of marine mammals, some of which are endangered, including: sei, blue, fin, humpback, sperm, and northern right whales; harbor porpoises; bottlenose dolphins; harbor seals; and West Indian manatees.[246] Several commenters warned the offshore wind development could impact such marine mammals in the NY Bight and that BOEM should consider these impacts.[247] One of these commenters added that there has been insufficient research to date on these impacts.[248]

Many commenters warned of the potential effects that features and accidents arising from offshore wind energy development could have on marine mammals and requested that BOEM analyze these impacts and consider potential mitigation measures; these factors included: noise, vessel traffic and strikes, EMFs, in-water structures, sedimentation from land and seabed disturbances, trash, oil spills, pile-driving, dredging, cable laying, drilling, turbine operation, intakes and discharges related to cooling

[243] Clean Ocean Action.
[244] New York State.
[245] Environmental Protection Agency.
[246] National Park Service; Clean Ocean Action.
[247] Mayor John A Peterson, Jr.; New York Offshore Wind Alliance; National Park Service; Clean Ocean Action.
[248] Clean Ocean Action.

offshore wind conversion stations, altered micro-climates, altered hydrodynamics, and prey entrainment.[249]

A commenter requested that BOEM identify seasonal distribution, abundance, and migration routes for marine mammals.[250] Another commenter recommended that the PEIS report the results of recent and ongoing marine mammal surveys in the NY Bight and report how developers will work together and with the research community to improve understandings of mitigation measures.[251]

Several commenters suggested BOEM devote particular attention to the endangered North Atlantic right whale and potential impacts to the species.[252] Another commenter echoed this concern, additionally claiming that fewer than 340 of the whales remain, with the NY Bight being part of their migratory corridor. This commenter argued that vessel traffic and noise exacerbate pressures on this population and that the PEIS should account for potential impacts on the species. This commenter further recommended that no construction or other offshore wind activity be allowed in the NY Bight during the whale's most sensitive times of the year, including migration periods.[253] Similarly, another commenter recommended that noisy construction activities only occur during the day and good weather conditions to maximize visual detection probability for the whales; this commenter further argued that even a single vessel strike on a North Atlantic right whale is an unacceptable risk given their status.[254]

Another commenter suggested considering no-build migratory routing measures for protected species like the North Atlantic right whale.[255] Similarly, another commenter expressed concern for potential impacts on the North Atlantic right whale's migration corridors from noise from turbines, including preventing migration and causing injury or death by interfering with the whales' ability to communicate. Furthermore, the commenter claimed that one possible reaction of whales to such a disturbance is to swim just beneath the surface, which increases the likelihood of vessel strikes.[256] Refer to Section O.4.14 for additional comments on ESA-listed species.

O.4.19 Navigation and Vessel Traffic

Approximately 10 commenters provided feedback on navigation and vessel traffic issues related to the NY Bight PEIS.

[249] National Wildlife Federation et al.; Clean Ocean Action; Massachusetts Office of Coastal Zone Management; National Park Service; New York State.

[250] New York State.

[251] Massachusetts Office of Coastal Zone Management.

[252] J. Binder; National Wildlife Federation et al.; K. Dreher; New York Offshore Wind Alliance.

[253] Clean Ocean Action.

[254] National Wildlife Federation et al.

[255] Responsible Offshore Development Alliance.

[256] Save Long Beach Island, Inc.

O.4.19.1 General Comments on Navigation and Vessel Traffic

Multiple commenters warned that offshore wind energy development in the NY Bight could increase vessel traffic. [257] One of these commenters added that this could impact marine mammals and sea turtles.[258] Another commenter warned that offshore wind development in the NY Bight would pose a threat to navigational safety for all commercial vessel traffic in the area.[259]

O.4.19.2 Specific Comments on Risks Posed by Increased Vessel Traffic

A commenter warned that offshore wind development in the NY Bight could interfere with marine radar, causing navigational safety risks, and cited a study to dispute BOEM's position that solid state and Doppler-based radars are adequate solutions to these impacts.[260] A couple of other commenters similarly expressed concern for the potential effects on marine radar.[261]

A commenter warned that wind farm construction could cause traffic impacts from construction vessels transporting turbine parts, from vessels exporting cable and upland infrastructure, and from the use of ports and operations and maintenance facilities.[262]

Another commenter expressed additional concerns about the effects of wind energy leasing in the NY Bight on navigation and vessel traffic, including:

- The scour protection employed by the developments could cause vessels' anchors to fail to hold and that interactions between anchors and cables could damage either.
- Turbines could increase collision risks with slow-moving maintenance vessels and by creating reefs that attract fishermen.
- Increased congestion and navigational complexity would increase crew fatigue, damage to vessels, injuries to crews, fuel spills, and engagement of USCG rescue teams.
- The development would significantly impact port utilization, increasing competition for berthing space and port services in the area and potentially further complicating national supply chain issues.[263]

A commenter warned that large vessel collisions in or around the lease areas could cause substantial environmental damage, and the emergency response and clean-up could severely restrict shipping lanes, causing significant economic impacts.[264]

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[257] National Wildlife Federation et al.; Mayor John A Peterson, Jr.
[258] National Wildlife Federation et al.
[259] World Shipping Council.
[260] Seafreeze Shoreside, Seafreeze Ltd.
[261] Long Island Commercial Fishing Association; Clean Ocean Action.
[262] New York State.
[263] Clean Ocean Action.
[264] World Shipping Council.

O.4.19.3 Recommendations with Respect to Navigation and Vessel Traffic

Turbine Spacing and Lane Markings

A commenter recommended that BOEM require that wind farms be organized in straight rows and columns, in a grid pattern, to facilitate navigation safety, consistent marking and lighting, search and rescue, and safe commercial fishing. The commenter further recommended that when multiple wind projects share a border, lessees be required to adopt the same spacing and layout across borders to present a single wind farm with consistent straight-line routes. If this is not possible, the commenter recommended that space be left between borders to provide a clear delineation, or that clear markings be applied to warn mariners of changes in spacing or orientation. Finally, the commenter said that all mooring systems and ancillary equipment should be confined to the lease areas.[265]

Similarly, another commenter recommended that transit corridors be established through proposed wind farms and turbine arrays, and that the PEIS consider alternative layouts and provide information on navigational risks and mitigation measures.[266] Another commenter similarly suggested that BOEM analyze spacing patterns between turbines and other infrastructure that could either allow fishing to continue or preserve more structure-free areas.[267]

Buffer Zones

Several commenters argued that around offshore wind energy development near port approaches, there should exist a minimum buffer zone of 2 nautical miles from the parallel outer or seaward boundary of a traffic lane and of 5 nautical miles from the entry or exit of traffic separation schemes.[268] One of these commenters argued that such a buffer zone is necessary for vessels to detect each other visually and by radar, to allow large vessels to maneuver during an emergencies, and to accommodate the “swing circles” of large anchored vessels. These commenters found that lease blocks included in the proposal fall within this such appropriate buffer zones around nearby port approaches.[269]

Accommodating United States Coast Guard Designations

A commenter suggested that BOEM consider referencing port access route studies to mitigate navigation safety risks from offshore wind energy installations. This commenter also suggested that BOEM consider the future uses of the “Ambrose anchorage,” an offshore area used by ships awaiting inshore anchorages or berths, located 3 nautical miles south of Long Beach, New York, which is the subject of a USCG Notification of Inquiry and is under consideration for the establishment of an anchorage ground. Furthermore, this commenter suggested that BOEM adopt the Marine Planning

[265] US Coast Guard.
[266] Massachusetts Office of Coastal Zone Management.
[267] Responsible Offshore Development Alliance.
[268] World Shipping Council; The American Waterways Operators.
[269] World Shipping Council.

Guidelines detailed in the Navigation and Vessel Inspection Circular 01-19 with respect to AMMM measures.[270]

Multiple commenters said that one of the proposed lease areas, assigned to Mid-Atlantic Offshore Wind LLC, conflicts with USCG's proposed NY Bight cut-across fairway, which, if developed, would create navigation hazards in the NY Bight; consequently, the commenters argued that this area should not be developed or that BOEM should comprehensively analyze the associated vessel traffic impacts.[271]

Marine Radar

Multiple commenters recommended that BOEM's PEIS include an analysis of potential impacts on marine radar, impacts that could interfere with search and rescue capabilities, and further suggested that USCG be given a role in assessing this risk and considering potential mitigation measures.[272] Another commenter echoed this concern about impacts on marine radar and the need for mitigation measures.[273]

Liability

A commenter questioned how BOEM intends to manage allision and height hazards, if BOEM plans to include safety zones, and if BOEM plans to hold vessels liable for collisions. This commenter further recommended that BOEM analyze the potential economic impacts of marine insurance companies raising premiums or denying coverage to operators in the area in response to increased vessel navigation risks.[274] Another commenter echoed the importance of BOEM addressing operator liability.[275]

Other Recommendations

A commenter provided several recommendations for BOEM regarding navigation impacts, including that BOEM:

- Evaluate risk from vessel allisions, collisions, and groundings.
- Assess impacts from displacement of traffic.
- Analyze risk to smaller vessels during construction.
- Assess conflicts with concrete mattresses and scour protection measures.
- Assess impacts of cable exposures.

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[270] US Coast Guard.
[271] The American Waterways Operators; Clean Ocean Action.
[272] Seafreeze Shoreside, Seafreeze Ltd.; Responsible Offshore Development Alliance.
[273] New York State.
[274] Seafreeze Shoreside, Seafreeze Ltd.
[275] New York State.

- Develop a plan for mariner communications and conduct routine check-ins with the New York/New Jersey Harbor Safety, Navigation, and Operations Committee to promote mariner safety.
- Identify best practices to minimize disruption to fishing from boulder relocation.
- Explore adapting mobile gears to navigate tighter corridors and continue engaging stakeholders regarding such equipment. [276]

A commenter recommended that BOEM study navigation with NMFS and USCG, work closely with USCG and relevant experts to improve safety in the area, develop safety mitigation measures, and include stakeholders in developing navigational aids such as lighting and markings.[277]

A commenter recommended that BOEM consider safety measures for vessel operations at night and in other low visibility conditions, consider approaches to minimize daily vessel traffic, and chart and communicate the placement of equipment and relocation of boulders to reduce the potential for allisions and gear damage. The commenter also recommended that the PEIS provide for communication and engagement with fishing industry members regarding the timing and duration of survey and construction activities before they commence.[278]

O.4.20 Noise

Six commenters provided feedback on noise as it relates to the NY Bight PEIS.

Some commenters discussed noise-related issues in their submissions, mostly regarding how noise from offshore wind projects might impact marine species. One commenter expressed concern regarding the impact of noise on marine life and fisheries.[279] Another commenter requested the region-wide examination of underwater noise on wildlife populations.[280] One commenter requested the provision of ambient noise levels for the Proposed Action, evaluation of potential sound penalties for onshore tonal noise impacts, assessment of the adequacy of proposed mitigation measures, evaluation of the impacts of offshore wind activities on marine mammals, and consideration of vibration-related impacts.[281] One commenter said that the PEIS should fully evaluate the consequences of pile-driving activities on marine mammal species, specifically stating that the PEIS should address the research gap on baleen whales and pile-driving; consider mysticetes and odontocetes in the PEIS; assess the impact of acoustic masking on marine mammal reproduction; and assess the impacts of persistent noise on marine mammals.[282]

One commenter stated that the scope of the PEIS should be expanded to include the New Jersey Wind Energy Area to account for cumulative impacts from turbine operational noise, citing concerns about

[276] New York State.
[277] Responsible Offshore Development Alliance.
[278] National Marine Fisheries Services.
[279] Mayor John A Peterson, Jr.
[280] New Jersey Offshore Wind Coalition.
[281] New York State.
[282] Clean Ocean Action.

impacts on North Atlantic right whale.[283] This commenter reviewed and cited research and submitted detailed analyses to support their position. The commenter suggested that the PEIS should contain estimates of elevated underwater noise levels based on studies they referenced and criticized BOEM for not including noise estimates from larger turbines. The commenter requested that the PEIS disclose the drive type of the turbines to be used for the projects and discussed their own analysis of research and its implications for expected turbine noise levels on masking North Atlantic right whale communication. They suggested that the PEIS should address how this masking from cumulative turbine operational noise could impact their migration capabilities.

Citing research on the adverse effects on marine wildlife from pile-driving noise, another commenter stated that “the installation of gravity-based or suction bucket (or ‘caisson’) foundations represents a ‘best practice’ in the context of the mitigation hierarchy.” [284] The commenter suggested that BOEM should coordinate with NMFS to characterize source noise levels during installation of foundations and use this information to ensure that installation mitigation and monitoring protocols are maximally protective. The commenter also urged BOEM to couple their foundation choice with a long-term monitoring program. The commenter suggested that BOEM design monitoring requirements to evaluate noise propagated through substrate during pile-driving by Rayleigh waves and their impacts on benthic invertebrates and demersal fish. The commenter also expressed concern about the impact of pile-driven bases of wind turbines impacting benthic creatures and suggested that mitigating this impact “would require acoustically decoupling the mast from the pile-driven base, or if the mast is below the waterline, acoustically decoupling the turbine from the mast.” They recommended BOEM include monitoring measures and adaptive management considerations for these issues in the PEIS.

This same commenter recommended using scientific information on the presence of marine mammals, especially the North Atlantic right whale, along with monitoring and mitigation systems to minimize impacts on these species. The commenter stated that no marine mammal species should be present in the Clearance Zone and that developers should only undertake pile-driving activities during times of good visibility or while using infrared technologies for visual monitoring. They also stated that pile-driving activities “should be commenced at least 1.5 hours before civil sunset” and that “lessees should not employ 24-hour pile driving.” The commenter discussed research and made specific recommendations about minimizing noise impacts, including requiring developers to use “the best commercially available combined NAS technology” and recommended soft-start procedures for pile-driving. The commenter cited research and commented on the impacts of vessel-related noise during wind farm construction, specifically noise produced by dynamic positioning systems, stating that BOEM should analyze these effects for individual projects and cumulatively. The commenter also recommended the use of “direct-drive turbines as opposed to turbines with a gear box” to minimize operational noise and impacts to marine species.

[283] Save Long Beach Island, Inc.
[284] National Wildlife Federation et al.

O.4.21 Oceanography

Seven commenters discussed issues related to oceanography in the NY Bight PEIS.

Several commenters expressed concern specifically about the impact that wind farms might have on the Mid-Atlantic Cold Pool.[285] Once commenter called for considering the impacts on the Mid-Atlantic Cold Pool cumulatively by accounting for the impacts of nearby wind farms and cited research suggesting that it was particularly vulnerable to hydrodynamic changes from wind farm structures.[286] Citing research, another commenter expressed concern about the cumulative impacts of wind turbines on the Cold Pool and subsequent effects on scallops, surf clams, the ocean food web, marine habitats, and migratory patterns on the mid-Atlantic Shelf.[287]

Other commenters discussed various other topics related to ocean ecology. One commenter stated the need to consider and evaluate currents, bathymetry, microclimates, and MetOcean data.[288] Additionally, the commenter called for the evaluation of micro-gyres; circulation changes around structures; scouring and sedimentation from turbine bases, cables, and scour protection; air circulation changes and sea surface temperature impacts; and assessment of seafloor and land disturbances from various wind farm construction and operation activities. This commenter also called for the evaluation of impacts on a variety of biological resources related to ocean and coastal habitats including identifying best management practices to reduce risks to the oceanic environment. Another commenter stated that the sea surface microlayer may be compromised due to wind farm activities.[289] This commenter also expressed concern about the impact of wind turbines on wakes, stating that the PEIS should include analyses of how the wake effect would be avoided at the six lease sites. The commenter listed several concerns they suggested should be included in the PEIS including microclimate effects of turbines such as turbulence, impacts on water temperature, and impacts on the sea surface microlayer. Additionally, the commenter stated that cooling offshore wind conversion stations could impact marine mammals through their intakes and discharges and suggested that the PEIS should prioritize the analysis of this issue.

Some commenters discussed impacts on marine life due to oceanographic changes. Citing research, a couple of commenters expressed concern about the impact that wind farms might have on the ecology of the area and commercial fishing and wakes.[290] One commenter expressed concern about the impact of large turbine arrays on wind and ocean current patterns and the resulting impacts on scallops.[291] The commenter stated that wind farms will alter patterns of scallop larval settlement and generally degrade the seabed environment.

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[285] Fisheries Survival Fund; Save Long Beach Island, Inc.; New York State; Seafreeze Shoreside, Seafreeze Ltd.; Wallace & Associates; Clean Ocean Action.
[286] Fisheries Survival Fund.
[287] Save Long Beach Island, Inc.
[288] New York State.
[289] Clean Ocean Action.
[290] Wallace & Associates; Seafreeze Shoreside, Seafreeze Ltd.
[291] Fisheries Survival Fund.

One commenter stated that relying on historical data for future “blue economy” planning is no longer reasonable given the rapidly changing nature of the ocean and that planning should therefore be based on future ocean conditions.[292]

O.4.22 Other Uses

Three commenters provided feedback on other uses relevant in the NY Bight PEIS.

One commenter called for an analysis of preconstruction surveys, suggesting that this would “facilitate the National Oceanic and Atmospheric Association's (NOAA) review, improve permitting efficiencies and consistency across projects, and ensure projects have sufficient time to collect at least two (2) years of baseline data.”[293] The commenter also urged BOEM to minimize disruptions to State and federal fisheries surveys through coordination with NOAA NMFS. They further called for the identification of U.S. Military training and exercises. Another commenter encouraged BOEM and developers to consider engaging with the fishing community during surveys as part of safety planning and risk identification.[294]

O.4.23 Recreation and Tourism

Seven commenters provided comments on recreation and tourism issues relevant to the NY Bight PEIS.

Some commenters expressed general concerns about the negative impacts that offshore wind projects may have on tourism economies, including lost revenue for businesses and jobs, and impacts on recreation.[295] One commenter asked if studies had been conducted investigating the impact on tourism and local economies due to turbines being visible from the shoreline.[296] Another commenter discussed the importance of tourism to the Fire Island National Seashore and Gateway National Recreation Areas.[297] A commenter also recommended evaluating measures to maintain public access and coastal use, tourism and recreational activities, and avoiding construction during peak tourism periods.[298] The commenter also mentioned that their respective Department of State had developed datasets for offshore diving and surfing areas important to their State and provided links to the datasets.

O.4.24 Scenic and Visual Resources

Approximately 10 commenters provided comments on scenic and visual resources.

Several commenters mentioned scenic and visual resources. Some commenters expressed general concern about and called for consideration regarding the visibility of wind turbines.[299] One commenter called for the elimination of visual assessments, stating that with the exception of Lease Area 544, the

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[292] Robert Griffin.
[293] New York State.
[294] NJDEP.
[295] Long Island Commercial Fishing Association; Mayor John A Peterson, Jr.; James Binder; Kimberly Dreher.
[296] Twin Lights Historical Society.
[297] National Park Service.
[298] New York State.
[299] New York State; Twin Lights Historical Society; Kimberly Dreher; James Binder.

NY Bight lease areas are more than 40 miles from the nearest shoreline.[300] A commenter stated that the PEIS should address the visual impacts of turbines, such as which communities or parks they would be visible from, the extent to which turbines would be visible, the weather conditions in which they would be visible, and how often the turbines would be visible throughout the year.[301]

Some commenters discussed how wind turbines might impact historic sites. One commenter stated that the PEIS should evaluate the cumulative impacts of new leasing areas and the Empire Wind Projects on "the uninterrupted sea view from the seven ocean-front historic districts and 31 miles of ocean beaches, dunes and water" and specified key observation points from the Gateway National Recreation Area to be included in the assessment.[302] The commenter recommended the same for visual impacts at Fire Island, similarly including key observation points for analysis and suggesting that their staff can assist with more detailed discussions on these topics. The commenter further recommended the inclusion of the Empire State Building, Green-Wood Cemetery, and Twin Lights Historic Site as National Historic Landmarks in the PEIS along with assessment of potential visual impacts.

One commenter recommended that BOEM "further define the 'historic maritime setting' in the PA or in subsequent guidance."[303] Additionally, the commenter encouraged BOEM to "ensure that the PA recognize that impacts from NYB projects on historic properties will vary significantly and are dependent on location of the turbines and export cables" and further recommended the development of a "consistent metric by which NHPA [National Historic Preservation Act] effects determinations are made across all NYB [NY Bight] projects." Another commenter suggested that they did not understand how BOEM would model visual assessment in the Cape May County and Point O'Woods areas.[304] The commenter stated that all historic districts, National Historic Landmarks, and properties listed or eligible for inclusion in the National Register of Historic Places should be included in vantage point simulations and specifically requested the inclusion of the Cape May Historic District and Point O'Woods. They also called for the consideration of lighting impacts on the night sky. Another commenter suggested that a turbine exclusion zone of at least 17.2 miles should be established in the Beach Haven Historic District to minimize adverse visual impacts on historic resources.[305]

O.4.25 Sea Turtles

Three commenters provided comments on sea turtles.

A few commenters mentioned sea turtles. One commenter recommended that the PEIS include a threat analysis matrix for endangered sea turtles living in the NY Bight area and cumulative impacts.[306] The commenter further recommended prioritizing "research to fill gaps in baseline data on sea turtle distributions, abundance, habitat use, and movements above stressor-specific investigations of effect to

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[300] Ted Barten.
[301] EPA.
[302] National Park Service.
[303] Attentive Energy LLC.
[304] Cape May County, NJ; Point O'Woods Association, Fire Island, NY.
[305] Borough of Beach Haven.
[306] Clean Ocean Action.

turtles, such as artificial reef effects, entanglements, vessel strike, or EMF." The commenter additionally stated there is no empirical data on noise threshold levels that would impact sea turtles and that the PEIS should consider the impacts on threshold shift and suggested that the PEIS should require the development of best practices by developers to minimize impacts on sea turtles. Another commenter called for consideration of the cumulative impact of wind project construction and operations on sea turtles, including noise, vessel traffic, EMF, and recommended visual and acoustic monitoring to detect sea turtles so construction can be avoided when they are present.[307] One commenter requested the identification of seasonal distribution, abundance, and migration routes of sea turtles and the evaluation of behavior and physiological impacts from vessel traffic, noise, foundation lighting, and EMF.[308]

O.4.26 Water Quality

Four commenters provided comments on water quality.

One commenter called for a review of the impacts of offshore wind on water quality.[309] Another commenter called for the evaluation of several factors related to sediment and deposition effects caused by offshore wind activities in the NY Bight area.[310] This commenter called for consideration of water quality impacts including considering New York State Water Quality Standards, modeling of the extent and duration of turbidity impacts, evaluation of changes to dissolved oxygen or nutrients in the overlying water column, and evaluation of cooling water intake structures on circulation and temperatures. The commenter further called for assessing the impacts of inadvertent spills, evaluation of methods for managing debris and waste, and considering impacts from cable heat transfer.

One commenter suggested that if vessels originating in foreign ports will be used during construction or maintenance of the wind farm projects, the PEIS should explain how they will prevent the discharge of ballast water to prevent the introduction of nonnative marine organisms.[311] The commenter expressed concern that discharge of pollutants may require National Pollutant Discharge Elimination System authorization and further recommended that the PEIS address whether the project will result in the discharge of pollutants into the water. This commenter also requested that BOEM consider the goals of the Comprehensive Conservation and Management Plan for the Barnegat Bay-Little Egg Harbor Estuary (e.g., water quality, water supply, living resources, and land use), which the Clean Water Act has designated an estuary of national significance.

A commenter called for the PEIS to fully investigate potential impacts of wind farm activities on ecologically important waterways and coastal habitats, drawing special attention to the New York/New Jersey Harbor Estuary, Peconic Bay Estuary, Barnegat Bay Estuary, Hudson Bay Estuary Program, Long Island South Shore Estuary Reserve, Hudson River National Estuarine Research Reserve, and Jacques

[307] National Wildlife Federation et al.
[308] New York State.
[309] Mayor John A Peterson, Jr.
[310] New York State.
[311] EPA.

Cousteau National Estuarine Research Reserve.[312] The commenter also stated that the PEIS should "evaluate worst case scenarios to determine impacts and assure emergency response capabilities will be available to ensure water quality" should vessel collisions cause a spill. The commenter suggested that the PEIS evaluate all risks and mitigation plans to account for the possibility of oil spills due to collisions. The commenter stated that it is likely the case that current design specifications (e.g., related to corrosion, corrosion protection) may not "capture the corrosivity of the environment, likely rendering impacts far different from any kind of assessments," and that industry codes for wind energy are not yet fully developed.

O.4.27 Wetlands and Other Waters of the United States

Three commenters provided comments on wetlands and other water resources in the United States.

A few commenters mentioned wetland and other water topics. One commenter stated that Executive Order 11990 Protection of Wetlands requires federal agencies to minimize degradation of wetlands and recommended the implementation of best management practices to comply with this directive.[313] They further suggested that the PEIS should assess impacts "that could result in a change (either permanent or temporary) of cover type within a wetland." This commenter additionally stated that impacts on streams and wetlands should be avoided or minimized in accordance with Section 404 of the Clean Water Act, that aquatic resources in the area should be delineated according to the 1987 Corps of Engineers Wetlands Delineation Manual and Regional Supplement. and that an evaluation of "cumulative effects of onshore activities at a watershed scale (i.e., hydrologic unit code 12) be provided to ensure that measures are undertaken to avoid and minimize the potential of cumulative impacts."

Citing research and discussing the importance of wetlands, another commenter called for the PEIS to identify and evaluate the potential impacts on wetlands due to wind energy development in the NY Bight and consider how impacts could be avoided and minimized.[314] The commenter also mentioned Executive Order 11990 and Section 404 of the Clean Water Act and stated that the PEIS must go beyond acknowledging the importance of wetlands and identify mitigation measures. The commenter suggested a testing a pilot project to improve data on wind energy development before undertaking industrial-scale development. Another commenter called for evaluating potential impacts of transmission installations on wetlands, inland waters, and their species; evaluating the impacts of clearing vegetation near "designated Wild, Scenic, & Recreational Rivers (WSR) and NYS Significant Coastal Fish and Wildlife Habitats (SCFWF)"; and evaluating impacts on freshwater and tidal wetlands in the area.[315] This commenter also called for evaluating impacts on saltmarshes and identifying protective measures, stating the significance of saltmarshes to New York State's marine district.

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[312] Clean Ocean Action.
[313] EPA.
[314] Clean Ocean Action.
[315] New York State.

O.4.28 Comments on Other Resource or Stressor Topics

Nine commenters provided comments on other resource or stressor topics.

Several commenters discussed various other issues related to resources or stressor topics. A couple of commenters mentioned using wind turbines to facilitate aquaculture or biodiversity. One commenter asked whether the government had considered establishing oyster beds or artificial reefs for wildlife at wind turbine bases.[316] Another commenter asked whether there were plans to employ aquaculture structures at the base of wind turbine foundations to "create habitats for mussels, oysters, sea weed and other sea life," suggesting that such structures could improve water quality and reduce reliance on sea food imports.[317] The commenter also asked how private companies could obtain permits to create, manage, and monetize such aquacultures. This commenter also asked how much energy would be generated for the NY Bight area and Monmouth County specifically and whether this proposal would eliminate fossil fuel use in the area. One commenter that BOEM adopt "net positive" biodiversity goals to guide the maintenance and enhancement of species and habitats impacted by offshore wind development.[318]

A couple of commenters mentioned security issues. One commenter recommended identifying emergency preparedness measures for severe storm events.[319] Another commenter expressed concern about offshore wind turbines' vulnerability to war time or terrorist attacks and stated that the issue should be addressed in the PEIS.[320]

One commenter stated that offshore wind energy is not emissions-free and argued that the "emissions from the activities necessary to prepare, build, operate, maintain, and decommission offshore wind energy facilities" should be included in the PEIS.[321] The commenter called for BOEM to address issues related to the amount of fossil fuel displacement that would occur due to offshore wind energy production. The commenter stated that it was unclear which State will receive the energy from the leases. The commenter additionally stated that the PEIS "must include all areas from where materials will be sourced for offshore wind project components in the environmental review," along with emissions data from turbine infrastructure production. The commenter called for the PEIS to evaluate secondary impacts related to onshore development needed to support the lease sales, management of dredged material, turbine malfunction, and security issues. This commenter expressed concern that wind energy development in the NY Bight requires the mining of rare earth elements with environmental consequences and suggested that the PEIS should consider these.

One commenter suggested requiring real-time cable monitoring technology for rapid identification of hazards, performing "micro siting" of wind energy infrastructure with fishermen familiar with the

[316] Jeffrey Tyler.
[317] Twin Lights Historical Society.
[318] The Nature Conservancy.
[319] New York State.
[320] James Binder.
[321] Clean Ocean Action.

ecosystem, and coordinating transmission to minimize infrastructure in the water and seabed.[322] This commenter also suggested defining thresholds to determine when environmental impacts are unacceptable and establishing adaptive management procedures. Another commenter discussed the importance of night skies and recommended the following: requiring an Aircraft Detection Lighting System to turn aviation obstruction lights on and off in response to detection of aircraft, shielding and directing security lighting downward, keeping lights off when they are not needed, using the minimum necessary brightness, using warm color-temperature lights, and requiring lighting plans in project-specific EISs.[323]

One commenter submitted comments on several various resource topics.[324] The commenter requested that BOEM consider changes that they would like acknowledged in the Draft PEIS including the impact of automation on the potential for job creation; the reliability and storage capabilities of wind energy systems; advancements in other types of renewable energy technologies; and the cost of offshore wind alternatives, among other issues. The commenter stated that the cost of offshore wind power is high, even after subsidies, suggested that those who use electricity derived from wind energy will have to pay more than they would for natural gas, and questioned how power grid transmission needs would be financed. The commenter questioned whether there was a federal agency that would be performing an analysis, comparing the cost reliability of wind energy to other clean technology alternatives, and requested that BOEM identify and assess backup technologies needs and plans if offshore wind output is rendered insufficient due to storms or low wind. The commenter stated onshore alternatives to offshore wind were available that could meet clean energy needs and questioned why they were not being considered. The commenter mentioned as an alternative the upgrading of "natural gas power plants to include combined cycles power generation." The commenter requested that BOEM "present a numeric analysis of impacts on greenhouse gas emissions of the Proposed Action and compare those emissions reductions to the increases in global greenhouse gas emissions." The commenter requested an analysis of the benefits of onshore clean technology.

O.5 National Historic Preservation Act/Section 106 and Programmatic Agreement

Comments associated with the National Historic Preservation Act (NHPA)/Section 106 process are discussed in this section.

O.5.1 Programmatic Agreement

Four commenters provided comments on the NHPA Programmatic Agreement.

A commenter supported BOEM's intention to develop an NHPA Section 106 Programmatic Agreement (PA) and recommended including, as consulting parties, the New York and New Jersey State Historic

[322] Responsible Offshore Development Alliance.
[323] National Park Service.
[324] James Binder.

Preservation Officers (SHPOs). The commenter also recommended including in the consulting parties from the Empire Wind development, the Advisory Council on Historic Preservation, and Native American Tribes. They cited 36 Code of Federal Regulations (CFR) 800.4(a)(2) as the engagement of the New York and New Jersey SHPOs as PA consulting parties.[325] Another commenter agreed that BOEM should coordinate with New York State's Office of Parks, Recreation and Historic Preservation (NYS OPRHP), which houses the State's SHPO.[326]

Another commenter recommended that BOEM develop a system to streamline Section 106 PAs for individual COPs by tiering them off the PA. The commenter added that impacts on historic resources will vary widely depending on the location of turbines and export cables, reasoning that, for instance, turbines located more than 23 miles from the shore may not be visible. The commenter recommended that BOEM develop consistent metrics to apply for NHPA determinations across the NY Bight COPs.[327]

The commenter also requested that BOEM provide more information as to when Section 106 consultations for the NY Bight will take place and conclude; they stated that geophysical surveys for windfarm development will need to take place soon and that the PA could impact the scale and scope of geophysical surveys to identify marine archaeological resources. Thus, the commenter wrote, information from BOEM as to when the PA will be available will help in the geophysical survey planning process.[328]

Another commenter stated that it accepted BOEM's invitation to become an NHPA Section 106 consulting party.[329]

O.5.2 Impacts on Historic Properties

Three commenters provided comments on impacts on historic properties.

A commenter cited Section 106 as requiring that federal agencies consider the impacts of their actions on historic properties. The commenter stated that, during recent virtual public meetings, consulting parties raised concerns about BOEM's process for identifying historic properties, addressing adverse impacts, and creating a framework to mitigate adverse impacts in a manner proportionate to their threat.[330] Another commenter generally requested that BOEM consider impacts on historic resources, including "submerged landforms."[331]

A commenter anticipated that the projects would have no impact on the visual character of onshore resources because the projects would be 42 and 54 miles offshore. The commenter further stated that BOEM has previously found wind turbines to cause adverse impacts on "historic maritime settings." The

[325] National Park Service.
[326] New York State.
[327] Attentive Energy LLC.
[328] Attentive Energy LLC.
[329] Invenergy Wind Offshore LLC.
[330] Cape May County, NJ; Point O'Woods Association, Fire Island, NY.
[331] New York State.

commenter requested that BOEM provide a definition of this term in the PA or other guidance. The commenter added that current conditions, such as vessel traffic, aircraft, modern structures, nighttime lighting, and other modern elements already compromise the "historic maritime settings" from the view of historic properties.[332]

O.5.3 Identification of Historic Properties Under NHPA

Three commenters provided comments on the identification of historic properties under NHPA.

A commenter provided several comments regarding the identification of historic properties under NHPA. The commenter provided an overview of National Historic Landmarks and the procedural safeguards afforded to the properties by NHPA Sections 106 and 110(f). The commenter stated that it has statutory responsibility for two National Parks and several National Historic Landmarks in the NY Bight and provided information in its comment to respond to BOEM's request for feedback regarding the identification of historic properties in the area. It described the Carrington Estate, several structures at Fire Island National Seashore, and locations at the Gateway National Recreation Area as historic properties that could be impacted by NY Bight development. The commenter requested that these National Parks and National Historic Landmarks be included in BOEM maps illustrating the NY Bight, offering to assist in this request by providing location data.[333] Also providing information on nearby historic properties, another commenter wrote that, pursuant to responsibility delegated to it by the New Jersey State Legislature, it has designated a historic district in Beach Haven that could be impacted by NY Bight development.[334]

A commenter recommended that BOEM design a phased identification process for marine archaeological resources within the NY Bight. The commenter suggested using, per 36 CFR 800.4(b)(2), phased identification efforts in progressively narrower surveys rather than implementing 30-meter survey intervals at the outset. The commenter reasoned that using 30-meter survey intervals results in overly detailed surveys of areas that development, because of preferred alternative selection or project design, ultimately would not affect. The commenter stated that using survey intervals of this precision increases costs and impacts on marine life. Application of a 30-meter survey interval to identify smaller, buried marine cultural resources could be done within the project footprint, the commenter suggested, following the issuance of a Record of Decision.[335]

O.6 Consultations

Comments associated with the various consultations are discussed in this section.

[332] Attentive Energy LLC.
[333] National Park Service.
[334] Borough of Beach Haven.
[335] Attentive Energy LLC.

O.6.1 ESA

Three commenters provided comments on ESA consultations.

A commenter emphasized that the ESA and Essential Fish Habitat (EFH) consultations are complementary and should be treated as such. The commenter reasoned that ESA and EFH consultations rely on standard project design criteria to avoid, minimize, and monitor impacts on ESA-listed species, designated critical habitats, and EFH.[336] A commenter recommended that BOEM integrate a framework for the ESA and EFH compliance, arrived at through coordination with NMFS and USFWS, into the purpose and need, alternative analysis, and effects analysis portions of the PEIS.[337]

Another commenter recommended that BOEM implement a programmatic process to facilitate interagency coordination itself and NOAA/NMFS in their ESA consultations for specific COPs.[338]

O.6.2 EFH

A commenter emphasized that the ESA and EFH consultations are complementary and should be treated as such. The commenter reasoned that ESA and EFH consultations rely on standard project design criteria to avoid, minimize, and monitor impacts on ESA-listed species, designated critical habitats, and EFH.[339]

O.6.3 Other (e.g., Marine Mammal Protection Act, Coastal Zone Management Act)

Five commenters provided general comments on other consultations, such as the Marine Mammal Protection Act (MMPA) and Coastal Zone Management Act (CZMA).

O.6.3.1 MMPA and CZMA

A commenter recommended a programmatic process be used to facilitate interagency coordination between BOEM and NOAA/NMFS in their MMPA consultations for specific COPs.[340] A commenter wrote that it may issue an incidental take authorization under MMPA for wind project development but that such an authorization would likely require further NEPA documentation. The commenter stated that, properly developed, a PEIS could support the issuance of a letter of authorization covering all COPs.[341]

A commenter stated that it is important to align the timing of CZMA reviews with New York Department of State (NYSDOS) Coastal Management Programs.[342]

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[336] National Marine Fisheries Services.
[337] Invenergy Wind Offshore LLC.
[338] American Clean Power Association.
[339] National Marine Fisheries Services.
[340] American Clean Power Association.
[341] National Marine Fisheries Services.
[342] New York State.

O.6.3.2 General Comments on Governmental Consultations

A few commenters generally recommended that BOEM coordinate with other federal agencies at the PEIS stage rather than only for specific projects.[343] One of the commenters reasoned that early coordination would help in cumulative analyses and in designing mitigation strategies, but also suggested that BOEM consider lessons learned in other OCS regions and avoid "artificial restrictions" that could prevent full utilization of the NY Bight.[344]

A commenter stated that BOEM should, under 43 United States Code 1337(p)(7), consider affected States' offshore wind procurement goals in evaluating NY Bight projects under NEPA and the Outer Continental Shelf Lands Act (OCSLA), reasoning that these goals are vital to the States' interest in the permitting process.[345] A commenter requested that BOEM continue to coordinate with New York through the PEIS and COPs processes, stating that New York State agencies will have statutory obligations to approve offshore wind transmission projects as well as transmission line siting. The commenter attached a document detailing the NYDOT's legal authorities relevant to NY Bight developments. Overall, the commenter recommended that BOEM coordinate with NYSDPS, NYSDOT, OPRHP, NYSDEC, and NYSDOS, with NYSDOS formally requesting to be a NEPA cooperating agency. The commenter also requested that BOEM confirm that the PEIS will not authorize development activities and that BOEM would not initiate federal consistency reviews at the PEIS stage.[346]

O.7 Comments on the Scoping Process

Three commenters provided comments on the scoping process.

A commenter recommended that BOEM use the scoping process to clarify a compensatory mitigation approach based on the best available science and designed to maximum ecological benefits, especially with respect to protecting biological diversity. The commenter recommended mitigation efforts such as acquiring critical coastal land or using management strategies to abate threats, and added that targeted properties for mitigation and monitoring may be outside the footprint of the projects themselves.[347]

Another commenter stated that the PEIS should consider impacts related to decommissioning, reasoning that such impacts are foreseeable and thus required under NEPA. Additionally, the commenter stated that decommissioning would be a major regional impact, and thus appropriate to analyze in the PEIS. The commenter added that decommissioning efforts can be expensive, describing one project in which decommissioning accounted for 20 percent of project costs.[348] Also addressing decommissioning, a commenter requested information on anticipated decommissioning of cable protection and scour protection areas. The commenter supported BOEM requiring the removal of

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[343] The Nature Conservancy, Atlantic Shores Offshore Wind, LLC.
[344] Atlantic Shores Offshore Wind, LLC.
[345] American Clean Power Association.
[346] New York State.
[347] The Nature Conservancy.
[348] Save Long Beach Island, Inc.

generation and transmission infrastructure during decommissioning, as long as such efforts would be accompanied by monitoring and contamination control measures.[349]

O.8 Other Comments

This section discusses comments that generally fell into miscellaneous categories.

O.8.1 Comments on NEPA Cooperating Tribal Government and Cooperating or Participating Agencies

Approximately 10 commenters provided comments on NEPA Cooperating Tribal Government and cooperating or participating agencies consultations.

O.8.1.1 Tribal Consultations

A commenter recommended that, to the extent federally recognized Tribes are impacted by activities described in the PEIS, the PEIS include a description of the processes and outcomes of consultations with Tribal Nations.[350] Another commenter stated that "the Delaware Nation; the Delaware Tribe; Cayuga; Mohican; Shinnecock; and Stockbridge-Munsee Community, Wisconsin; and one State recognized Tribe, the Unkechaug" have interests in the south shore of Long Island, urging BOEM to consult with these Tribes throughout the NY Bight OCS process.[351] Another commenter recommended that BOEM take a lead role in organizing tribal outreach for the NY Bight for both Section 106 consultations and NEPA cooperation; the commenter reasoned that doing so would promote efficiency and, consistent with an August 1, 2022, BOEM letter, reduce stakeholder burdens.[352]

O.8.1.2 Interagency Coordination

A commenter recommended that BOEM coordinate with NOAA, the United States Army Corps of Engineers (USACE), and the Advisory Council on Historic Preservation to ensure that the agencies conduct programmatic analyses in parallel with the PEIS, agree on AMMM measures, and commit to similar timelines.[353] Another commenter agreed, stating that a standalone PEIS from BOEM, without interagency consultation, would be inefficient.[354]

A commenter stated that it would, in a separate letter, accept cooperating agency status under NEPA for the PEIS and consulting party status under NHPA.[355]

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[349] New York State.
[350] EPA.
[351] New York State.
[352] Invenergy Wind Offshore LLC.
[353] American Clean Power Association.
[354] Invenergy Wind Offshore LLC.
[355] National Park Service.

A commenter stated that, given the scope of the PEIS, BOEM should collaborate with "NMFS, state fishery agencies, fishery management councils and commissions, ocean data experts including the Regional Ocean Partnerships, United States Integrated Ocean Observing System (IOOS), [and the] NOAA National Centers for Coastal Ocean Science (NCCOS)," and should also consider fishing industry-held data and "fishermens' [sic] ecological knowledge."[356] Another commenter stated that the New Jersey Research and Monitoring Initiative (RMI) studies marine and coastal resources concerns related to New Jersey offshore wind development and has partnered with NYSERDA, the Regional Wildlife Science Collaborative, and the Responsible Offshore Science Alliance. The commenter supported BOEM coordinating research and monitoring efforts.[357] A commenter stated that input from other agencies is still needed, providing as an example a take request from NMFS for North American right whales.[358]

Another commenter agreed, reasoning that consulting agencies may have focuses other than energy development and thus that BOEM should insist on relevant statutory deadlines—in particular, the commenter emphasized the importance of close coordination between BOEM and NOAA, USACE, USFWS, and the Advisory Council on Historic Preservation to ensure an efficient review process.[359]

A commenter stated that, in previous offshore wind leasing projects, there has been insufficient coordination with local governments; the commenter raised the "Rhode Island SAMP [Special Area Management Plan] process" and Vineyard Wind as examples in which New York fisherman had too little representation.[360]

O.8.2 Comments on Potential Authorizations

No comments are associated with this issue.

O.8.3 Comments on the Timeline for the Notice of Availability of the Draft PEIS

Eight commenters provided comments on the timeline for the Notice of Availability (NOA) of the Draft PEIS.

Several commenters supported the programmatic approach, emphasizing its importance in expediting reviews and ultimately the authorization of COPs.[361] A couple of commenters also recommended that BOEM should take an active role to ensure that environmental reviews remain on schedule.[362] A commenter emphasized the importance of timeliness in environmental reviews for the NY Bight and recommended that BOEM impose a firm schedule for its consultations with NOAA, USACE, and other agencies.[363]

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[356] Responsible Offshore Development Alliance.
[357] NJDEP.
[358] J. Binder.
[359] Community Offshore Wind.
[360] Long Island Commercial Fishing Association.
[361] Invenergy Wind Offshore LLC, Community Offshore Wind.
[362] Community Offshore Wind, OW Ocean Winds East, LLC.
[363] Atlantic Shores Offshore Wind, LLC.

To facilitate the PEIS's role in expediting the NY Bight environmental reviews, a commenter recommended that drafts for specific COPs be initiated before the finalization of the PEIS; the commenter reasoned that doing so would provide flexibility for different tiering approaches and ensure the PEIS does not inhibit project-specific reviews.[364] Another commenter also emphasized that the PEIS process should be concluded within 2 years. As part of that process, the commenter stated that the representative project design envelope (RPDE) should be defined and the AMMM measures selected in a manner consistent with leaseholder needs; in particular, the commenter stated that AMMM measures should include reasonably foreseeable options. The commenter stated that, to facilitate timeliness, the scope of the PEIS should include all issues common across the NY Bight.[365]

Conversely, another commenter questioned the role of a PEIS in expediting the leasing process, stating that, in the August 2 meeting, BOEM statements on PEIS efficiency failed to recognize the capacity for developers to quickly collect field data and prepare for COPs. The commenter also stated that New York and New Jersey appear prepared to move forward with leasing, stating that "NYSERDA has teed up RFP3S, (2,000 MW minimum) while NJ BPU has teed up RFP 3 for Q1, 2023 (1,200 MW minimum)." The commenter questioned if developers, New York, and New Jersey agreed with the PEIS approach. In considering impacts on timeliness, the commenter stated that BOEM should consider the impact of delays on carbon dioxide emissions.[366] Another commenter expressed concern that the PEIS could impose delays because the process for offshore wind development is untested.[367]

Another commenter expressed concern for an expedited NY Bight PEIS timetable. The commenter stated that ongoing litigation involving wind turbines could impact developer permitting goals.[368] Another commenter stated that the "Fast 41" initiative, and the fast-tracking of development, serves private developers' interests at the expense of BOEM's duty to hold offshore resources in the public trust. The commenter expressed concern for the impacts of NY Bight development to marine life and stated that 60 days for review should be provided for the environmental review documents relevant to the project.[369]

O.8.4 Comments on Public Comment Process/Engagement

Approximately 10 commenters provided comments on the public comment process or engagement.

O.8.4.1 Public Outreach

A commenter recommended that BOEM develop a Community Outreach Plan to include in NEPA documentation and ensure that documentation is available to linguistically isolated communities.[370] Another commenter generally agreed that the BOEM should make efforts towards public participation

[364] Attentive Energy LLC.
[365] Community Offshore Wind.
[366] T. Barten.
[367] OW Ocean Winds East, LLC.
[368] Cape May County, NJ; Point O'Woods Association, Fire Island, NY.
[369] Clean Ocean Action.
[370] EPA.

and consultation with local communities.[371] A commenter stated that BOEM should continue to engage with the public and stakeholders in the scoping process for NY Bight environmental reviews.[372]

A commenter provided a citation in recommending that BOEM convene a roundtable with DAC stakeholders as part of PEIS development. The commenter recommended identifying DACs by coordinating with the Intergovernmental Renewable Energy Task Force and by using a Climate and Economic Justice Screening Tool. The commenter attached a sample agenda for such a roundtable. The commenter also recommended that BOEM post documentation and notes relevant to DAC outreach and engagement to the BOEM website, similar to BOEM practices for the Intergovernmental Renewable Energy Task Force.[373] Another commenter stated that BOEM should consider implementing an adaptive management plan to address the possibility of environmental impacts that become more significant than initially anticipated. The commenter stated that this plan may include roles for non-fishing stakeholders or community liaisons. In addition, the commenter recommended that BOEM develop a mariner communication plan.[374]

A commenter stated that some of the benefits of the PEIS approach could be realized by coordinating with developers, citing the 1- by 1-nautical mile east–west/north–south grid agreed upon by developers in the Massachusetts WEA.

O.8.4.2 Public Comment Process

A commenter suggested that 45-day comment periods be provided for NY Bight environmental reviews and added that commenters should, because of the tiering approach to reviews, have the right to revisit and comment further on COP-specific NEPA analyses beyond this period.[375] Another commenter requested that all future environmental review documents, including environmental assessments, be available in draft form for public comment.[376]

A commenter expressed concern that the NY Bight environmental review processes have not been concluded before leases are awarded to developers. The commenter stated that the public comment period for the NY Bight has been too short and that public hearings should be held. Furthermore, the commenter stated that BOEM has privileged the importance of New York's interests, rather than those of New Jersey, in the NY Bight project.[377] Another commenter stated that BOEM has recently entered into several "fast-tracked" memoranda of understanding and PAs relevant to offshore wind; the commenter stated that BOEM should clarify how these fast-tracked documents are being implemented for NY Bight lease developments and environmental reviews.[378]

[371] New York State.
[372] Invenergy Wind Offshore LLC.
[373] Aspen Institute.
[374] New York State.
[375] US Coast Guard.
[376] New England and Mid-Atlantic Fishery Management Councils.
[377] Borough of Seaside Park.
[378] Clean Ocean Action.

A commenter recommended that lessees in contiguous areas consolidate their public outreach processes for the fishing industry, reasoning that, for instance, there are similar interests for scallop fishers across all six lease areas.[379]

O.8.4.3 Transparency and Information Availability

A commenter stated that good governance requires public trust in project development and transparency.[380] Additionally, the commenter stated that research on wind farm impacts is disparate and that creating a centralized portal for this research would be useful. The commenter emphasized the importance of the PEIS using the best available science and dynamic modeling based on multiple scenarios. The commenter stated that, in evaluating research, BOEM should consider whether research comes from disinterested parties or researchers with conflicting financial motivations.[381] Another commenter also recommended that BOEM support a centralized data portal for information on the environmental impacts of offshore wind development.[382]

O.8.5 Request to Extend Public Comment Period

Two commenters provided comments about extending the public comment period.

A commenter recommended that the comment period for the programmatic DEIS "be extended by a minimum of 3 months" from the 45-day norm, and that BOEM issue a supplemental EIS if more information or inputs become available later.[383]

A commenter recommended that the comment period for the PEIS scoping be extended.[384] Another commenter stated that the public comment period for NY Bight development was too short.[385]

O.8.6 Comments on the Programmatic Approach

Approximately 10 commenters provided comments on the programmatic approach.

O.8.6.1 Support for the Programmatic Approach

A commenter supported the use of a PEIS in the NY Bight as the best way to assess impacts and examine alternatives. The commenter also stated that the PEIS standpoint will allow BOEM to examine potential export cable connection points and identify AMMM measures. However, the commenter questioned how the proposed framework would parse negligible, minor, moderate, and major impacts. The commenter recommended that the PEIS compare alternative, full build-outs for the NY Bight—rather than a representative project—and consider requiring a suite of AMMM measures as conditions of COP

[379] Fisheries Survival Fund.
[380] Clean Ocean Action.
[381] Clean Ocean Action.
[382] R. Griffin.
[383] J. Binder.
[384] J. Binder.
[385] Borough of Seaside Park.

approval. The commenter recommended that BOEM utilize representative projects for each lease as appropriate for a basic review of protected species, habitat, fisheries overlaps, and navigational conflicts for a full build-out analysis.[386] Another commenter also expressed support for the programmatic approach, anticipating that the PEIS would include planning for offshore wind infrastructure to minimize impacts on natural resources. The commenter also emphasized the importance of, within the PEIS, standardizing data collection for research and monitoring of impacts on wildlife and fisheries.[387] Another commenter urged BOEM to coordinate planning with the Department of Energy while also facilitating preconstruction surveys.[388] A commenter supported the PEIS as a way to discuss cumulative impacts and facilitate captains', anglers', and other stakeholders' input.[389]

Another commenter stated that the programmatic approach could improve the efficiency of the permitting process while programmatic AMMM measures could make impacts more predictable.[390] A commenter stated that PEIS can help mitigate environmental impacts by improving project citing. The commenter supported using a PEIS overall but stated that specific COPs should be assessed by a full EIS rather than an environmental assessment.[391]

O.8.6.2 Criticism of the Programmatic Approach

Conversely, a commenter opposed the PEIS approach as "bifurcating" reviews and threatening historic properties. The commenter stated that a better approach would "take into account all the interrelated historical, cultural, scientific and economic impacts and threats" associated with NY Bight wind power development. The commenter added that there have been insufficient pilot projects and scientific review to support NY Bight development. The commenter also stated that BOEM failed to follow its own regulations by issuing a proposed sale notice before an environmental review. The commenter stated that BOEM's process violates NEPA by providing too little scientific basis for a proposed action.[392] Another commenter stated that impacts, such as impacts on fisheries, should be evaluated on a project-specific level.[393]

Another commenter questioned whether a PEIS is appropriate, stating that a prior EIS for an offshore windfarm minimized impacts on sea turtles as "minor."[394] Also discussing minor impacts, another commenter hoped that BOEM will be able to identify minor environmental impacts, such as EMFs around transmission cables, at the PEIS stage.[395]

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[386] National Marine Fisheries Services.
[387] NJDEP.
[388] New York State.
[389] American Saltwater Guides Association.
[390] The Nature Conservancy.
[391] National Wildlife Federation et al.
[392] Borough of Seaside Park.
[393] Fisheries Survival Fund.
[394] Clean Ocean Action.
[395] American Clean Power Association.

O.8.6.3 Other Comments on the Programmatic Approach

A commenter stated that BOEM should disclose all important information relevant to the PEIS and state when information is unavailable or incomplete, providing a citation. The commenter emphasized the importance of accurate, up-to-date information to inform its environmental reviews and its characterization of impacts as minor or major. The commenter recommended that, in situations where the predictive certainty of possible impacts is low, BOEM require monitoring and provide adaptive management recommendations.[396] Another commenter stated that the PEIS should be based on sound science according to "standards for which scientific validation will be used." The commenter said the PEIS should provide a framework for incorporating new science and "benchmarks" that BOEM would use to assess the project's impacts.[397]

A commenter recommended that BOEM describe standardized processes and metrics to evaluate deviations from the PEIS.[398] Another commenter requested that the Draft PEIS include an explanation of changes since BOEM efforts to develop a PEIS in 2007. The commenter also requested that the PEIS include a quantified cost-benefit analysis that includes impacts on electric ratepayers.[399]

A commenter stated that the PEIS for the NY Bight should not be applied to other regions as the PEIS will be based on region-specific data.[400]

A commenter stated that they recognize the benefits inherent in a programmatic approach to assessing the common impacts of offshore wind development and measures to mitigate those impacts. However, the commenter appreciated that BOEM has been clear that individual projects may submit a COP in a timeline that best suits their needs.[401]

O.8.7 Comments on the RPDE (Including Cable Routes, Landfalls, etc.)

Approximately 17 commenters provided comments on the RPDE.

O.8.7.1 Need for Flexibility in RPDE Analysis or Design Parameters

A commenter expressed concern with respect to the RPDE, stating that developers are likely to change the scope of their COPs after the PEIS is finalized and that it could be difficult to adjust environmental reviews to these changes while adhering to project timelines. The commenter provided an example of this from the Vineyard Wind offshore wind project.[402]

A commenter urged BOEM to examine a variety of representative models using different technologies, and, in particular, models using "quiet technology fixed-foundations" and floating wind technology. The

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[396] National Wildlife Federation et al.
[397] Clean Ocean Action.
[398] New York State.
[399] J. Binder.
[400] American Clean Power Association.
[401] Attentive Energy LLC.
[402] Seafreeze Shoreside, Seafreeze Ltd.

commenter recommended that BOEM's analysis consider impacts on waves based on differing foundations, providing citations. The commenter stated that quiet technologies may cause less harm to marine mammals and thus expedite MMPA reviews.[403] Another commenter agreed that the RPDE should evaluate several representative projects and consider technologies to avoid and minimize environmental impacts. The commenter provided a list of its own priorities in RPDE design, including evaluating gravity-based and suction bucket alternatives, using vibro pile versus impact piling, and factors relevant to scour protection and timing of activities.[404] Another commenter also provided numerous recommendations for project planning, siting, and design to minimize environmental impacts.[405]

Other commenters stated that, because the PEIS process may take years and offshore wind technology is advancing, the RPDE should not prescribe the use of certain technologies[406] or should anticipate the development of technological advances.[407] A few commenters said that BOEM should design its RPDE around a set of principles and outcomes rather than means of achieving those outcomes.[408] One of the commenters said that, in addition to technology, the RPDE should not specify project layout or siting within the lease area.[409] Another commenter said that, under a "maximum-case scenario," specifying project parameters such as foundation type does not assist project design. The commenter recommended that project parameters should instead focus on environmental impacts.[410] A commenter provided citations to recent redesigns in the Vineyard Wind project, arguing that these indicate that even an RPDE designed to accommodate changing wind turbine technologies may be unable to anticipate changing developer preferences over 2 years.[411] A couple of other commenters stated that BOEM should consult with turbine manufacturers and other equipment providers to develop the RPDE.[412] One of the commenters stated that, once BOEM has done so and produced an RPDE, it should present the RPDE to leaseholders for comment.[413] A comment stated that it is difficult for developers to provide locations for landing sites and onshore facilities at the PEIS stage because these decisions rely on State permitting. The commenter recommended that BOEM assess categories of landing sites and onshore facilities, arguing that such an approach is appropriate under OCSLA and would allow evaluation of various impact-producing factors.[414]

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403 National Wildlife Federation et al.
404 The Nature Conservancy.
405 National Marine Fisheries Services.
406 Vineyard Offshore LLC, American Clean Power Association, Atlantic Shores Offshore Wind, LLC, New York Offshore Wind Alliance.
407 New England and Mid-Atlantic Fishery Management Councils, Community Offshore Wind.
408 American Clean Power Association, New York Offshore Wind Alliance.
409 Atlantic Shores Offshore Wind, LLC.
410 Invenergy Wind Offshore LLC.
411 Seafreeze Shoreside, Seafreeze Ltd.
412 Community Offshore Wind, OW Ocean Winds East, LLC.
413 OW Ocean Winds East, LLC.
414 Attentive Energy LLC.

A commenter said that BOEM should base its RPDE on public information for similar projects and should consult with DOE on the reasonably foreseeable limits of technical and economic feasibility.[415] Another commenter agreed that BOEM should rely on information from other projects to characterize "minor" impacts or to inform analysis.[416] With respect to economic feasibility, a commenter also recommended that BOEM consider supply chain issues and tax credit availability under the Inflation Reduction Act in its RPDE.[417]

O.8.7.2 Power Transmission

Several commenters addressed wind power transmission. One urged BOEM to consider a backbone transmission effort and comparative cable corridor development impacts as part of the PEIS.[418] A commenter stated that BOEM should consider Wind Turbine Generator (WTG) layout and spacing to accommodate fishing and transit needs. The commenter stated that the layout should maximize efficiency for cable layouts to serve neighboring projects—such as Ocean Wind and Atlantic Shores—and minimize turbulent flow and wake effects.[419] Another commenter agreed that BOEM should consider backbone transmission designs and coordinating power transmission among multiple projects.[420]

Another commenter stated that BOEM should require the use of jet plows to bury inter-array cables, providing citations and stating that this method causes the fewest adverse environmental impacts. The commenter added that BOEM should consider implementing seasonal restrictions on cable burial to protect wildlife. Additionally, the commenter stated that BOEM should take into account how cable burial increases turbidity and how developers can minimize these impacts. Finally, the commenter asserted that open loop cooling systems for direct current transmission would not be appropriate in the NY Bight, citing the impacts of such systems from another EIS.[421]

Another commenter recommended that BOEM, as ways to minimize mobilization of the seabed from burying cables, consider requiring that developers:

- Include a robust siting analysis to avoid dynamic areas with known high seabed mobility.
- Include mariner notifications of shallow-buried and exposed cables and cable protection measures.
- Include methods to monitor and maintain target burial depth for the maximum possible distance and expeditiously repair/rebury cable(s).
- Evaluate adaptive management if repeated cable exposures occur.

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415 Invenergy Wind Offshore LLC.
416 T. Barten.
417 American Clean Power Association.
418 National Wildlife Federation et al.
419 EPA.
420 New England and Mid-Atlantic Fishery Management Councils.
421 National Wildlife Federation et al.

With respect to submarine cable system burial and risk assessment, the commenter recommended that BOEM:

- Include draft assessment in the COP and BOEM's COP-specific NEPA analysis.
- Evaluate existing and emerging cable installation techniques to achieve target burial depth for the maximum possible distance.
- Evaluate secondary cable protection measures and include how impacts have been avoided and minimized to the greatest extent possible.[422]

Another commenter recommended that, with respect to power transmission RPDE concerns, BOEM consider:

- Potential incorporation of meshed or shared offshore transmission.
- Closed vs open-loop cooling of offshore AC/DC conversion stations.
- Operational noise profiles among alternative turbine options.
- Cable route options (particularly focusing on conflict avoidance and improved energy delivery opportunities).[423]

Another commenter recommended that BOEM require submission of as-built surveys to identify cable protection areas and extant cables in a project area.[424]

O.8.8 Comments on the Proposed Tiered Review Process

Six commenters provided comments on the proposed tiered review process.

A commenter supported a tiered review process for NY Bight development and expressed optimism that leaseholders, regulators, and stakeholders can collaborate for an efficient environmental review process.[425] A commenter also supported the approach and recommended that BOEM provide sufficient detail in the PEIS to "support impact assessment at a landscape level" and prevent the duplication of analyses at the COP level.[426] Another commenter supported the tiered approach, stating that the approach should avoid the repeated discussion of similar issues for multiple projects. The commenter added that the tiered approach should facilitate the adoption of programmatic AMMM measures where appropriate while preserving flexibility for AMMM measures to address site-specific needs.[427]

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[422] New York State.
[423] The Nature Conservancy.
[424] New York State.
[425] Vineyard Offshore LLC.
[426] Atlantic Shores Offshore Wind, LLC.
[427] New York Offshore Wind Alliance.

A commenter expressed concern that, if the PEIS is implemented, there will not be enough time to conduct thorough environmental analyses for specific COPs.[428]

A commenter wrote that adopting a tiered approach for windfarm development artificially bifurcates environmental review and prevents effective analysis of cumulative impacts. [429] Several commenters stated that more detail as to the tiered review process is needed.[430] The commenters asked, in particular, how "minor" environmental impacts will be handled at the project-specific tier of review.[431] Another stated that pre-approving AMMM measures has not previously been done in BOEM offshore wind leasing.[432]

O.8.9 Other Comments

Eight commenters provided other general comments on the PEIS, including comments specific to a lease area.

A commenter asserted that areas already leased at auction should be considered for the PEIS, not only those within NY Bight.[433] Another commenter added that the New Jersey lease area should be included in the scope of the PEIS.[434]

A commenter stated that BOEM should consider how recent commitments from New York and New Jersey to wind energy development demonstrate support for a local supply chain and how stakeholder engagement requirements affect the development of AMMM measures.[435]

A commenter wrote in support of green construction methods, including recycling materials and using energy-efficient technologies.[436]

A commenter stated that offshore wind development will be vital to meeting clean energy goals in the Northeast and mid-Atlantic, stating that it is currently impracticable to transmit energy from the "wind-belt" states.[437]

A commenter stated that it has performed research relevant to NY Bight development, providing citations. The commenter wrote that BOEM should reach out to its studies' authors to integrate their findings into BOEM's analyses.[438]

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[428] Seafreeze Shoreside, Seafreeze Ltd.
[429] Clean Ocean Action.
[430] Clean Ocean Action, Seafreeze Shoreside, Seafreeze Ltd.
[431] Clean Ocean Action, Seafreeze Shoreside, Seafreeze Ltd.
[432] Seafreeze Shoreside, Seafreeze Ltd.
[433] Long Island Commercial Fishing Association.
[434] Save Long Beach Island, Inc.
[435] Invenergy Wind Offshore LLC.
[436] EPA.
[437] T. Barten.
[438] Responsible Offshore Development Alliance.

A commenter listed lease blocks that fall into buffer zones identified by the Mid-Atlantic Marine Portal and cited a visual depiction to that end.[439]

A commenter asserted that, because leaseholders will develop COPs in parallel with the PEIS process, BOEM must coordinate with leaseholders up to the September 2023 Draft EIS to minimize delays.[440]

O.9 Out of Scope

A commenter provided comments on BOEM's "Process for Identifying Alternatives for Environmental Reviews of Offshore Wind COPs pursuant to the National Environmental Policy Act (NEPA)," stating that this document was never open for public comment and inaccurately reflects BOEM processes.[441]

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[439] World Shipping Council.
[440] OW Ocean Winds East, LLC.
[441] Seafreeze Shoreside, Seafreeze Ltd.