APPENDIX A

Required Environmental Permits and Consultations

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Introduction

This appendix discusses required permitting and public, agency, and tribal involvement in the preparation of the Revolution Wind Farm (RWF) and Revolution Wind Export Cable (RWEC) Project (the Project) environmental impact statement (EIS). This involvement included formal consultations, cooperating agency exchanges, and a public scoping comment period.

Authorizations and permits are listed in Table A-1, and cooperating or participating federal agencies are described below. The Bureau of Ocean Energy Management (BOEM) has completed the following interagency milestones to date for the Project:

- Finalize purpose and need: April 19, 2021
- Concurrence on permitting timetable: April 19, 2021
- Issuance of notice of intent (NOI) to prepare an EIS: April 30, 2021
- Issuance of notice of correction: June 4, 2021
- Complete public scoping period: June 11, 2021
- Finalize Draft EIS alternatives: April 19, 2022

Other Federal and State Review

In addition to the BOEM-led National Environmental Policy Act (NEPA) process at the federal level, the Project is also being reviewed through a robust state permitting process, including the Rhode Island Department of Environmental Management; the Rhode Island Coastal Resources Management Council (RI CRMC); the Massachusetts Office of Coastal Zone Management (MA CZM); and various state historic preservation offices (SHPOs), including the Rhode Island Historic Preservation & Heritage Commission, the Massachusetts Historical Commission, the Connecticut State Historic Preservation Office, the New York State Division of Historic Preservation, and the Massachusetts Board of Underwater Archaeological Resources through Section 106 of the National Historic Preservation Act (NHPA). BOEM is also coordinating with federally and non-federally recognized tribal nations, local governments, and non-governmental organizations.

Table A-1 provides a discussion of other federal and state reviews required, including legal authority, jurisdiction of the agency, and the regulatory process involved.

Table A-1. Cooperating Federal and State Agencies, Required Environmental Permits, and Consultations for the Project

Agency/Regulatory Authority	Cooperating Agency Status	Permit/Approval/Consultations	Status
Federal			
Advisory Council on Historic Preservation	Participating agency	None	Not applicable
BOEM	Lead federal agency	Construction and operations plan (COP) approval	Original COP filed with BOEM on October 30, 2020; COP updates provided on April 29, 2021; December 15, 2021; July 21, 2022; and March 1, 2023
Bureau of Safety and Environmental Enforcement	Cooperating agency	Facility design report/Fabrication and installation report, oil spill response plan, safety management system, and decommissioning for project	Planned
National Park Service	Participating agency	None	Not applicable
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service	Cooperating agency	Letter of authorization (LOA) for incidental take regulations (ITRs) Essential fish habitat consultation Endangered Species Act (ESA) consultation	Planned
U.S. Department of Defense, U.S. Army Corps of Engineers	Cooperating agency	Clean Water Act Section 404/Rivers and Harbors Act of 1899 Section 10 Individual Permit	Planned
U.S. Department of Defense	Participating agency	None	Not applicable
U.S. Department of Transportation, Federal Aviation Administration	Participating agency	Obstruction evaluation/airport airspace analysis	Planned
U.S. Department of Homeland Security, U.S. Coast Guard	Cooperating agency	Private Aids to Navigation Permit	Planned

Agency/Regulatory Authority	Cooperating Agency Status	Permit/Approval/Consultations	Status
U.S. Department of the Navy	Participating agency	None	Not applicable
U.S. Environmental Protection Agency	Cooperating agency	Outer Continental Shelf Air Permit	Planned
U.S. Fish and Wildlife Service	Participating agency	ESA consultation	Planned
State (portions of the Project within state jurisdiction)*			
State of Rhode Island Coastal Resources Management Council	Cooperating agency	Coastal Zone Management Act (CZMA) Consistency Certification Category B Assent/Submerged lands license Permit to Alter Freshwater Wetlands in the Vicinity of the Coast Application for Marine Dredging and Associated Activities	Filed on June 7, 2021; concurrence issued on May 12, 2023 Filed on July 1, 2021; completed Q1 2023 Filed on July 1, 2021 Filed on July 1, 2021
State of Rhode Island Department of Environmental Management	Cooperating agency	Section 401 and State Water Quality Certification/Rhode Island Pollutant Discharge Elimination System Construction General Permit (filed concurrently) Application for Marine Dredging and Associated Activities (see above)	Filed on August 3, 2021
MA CZM	Cooperating agency	CZMA Consistency Certification	Filed on June 7, 2021; concurrence issued on May 10, 2023
Connecticut State Historic Preservation Office, Connecticut Department of Economic and Community Development	Not applicable	NHPA Section 106 consultation	Not applicable
Rhode Island Historical Preservation & Heritage Commission	Not applicable	NHPA Section 106 consultation	Not applicable

Agency/Regulatory Authority	Cooperating Agency Status	Permit/Approval/Consultations	Status
New York State Division for Historic Preservation	Not applicable	NHPA Section 106 consultation	Not applicable
Massachusetts Historical Commission	Not applicable	NHPA Section 106 consultation	Not applicable

* State agencies may be cooperating agencies under NEPA.

Cooperating Agencies

As part of the NEPA process, BOEM invited other federal agencies and state, tribal, and local governments to consider becoming cooperating agencies in the preparation of the EIS. According to Council on Environmental Quality (CEQ) guidelines, qualified agencies and governments are those with "jurisdiction by law" or "special expertise" (40 Code of Federal Regulations [CFR] 1501.8). BOEM asked potential cooperating agencies to consider their authority and capacity to assume the responsibilities of a cooperating agency and to be aware that an agency's role in the environmental analysis neither enlarges nor diminishes the final decision-making authority of any other agency involved in the NEPA process. BOEM also provided potential cooperating agencies participating in the FAST-41 process with a written summary of expectations for cooperating agencies, including time schedules and critical action dates, milestones, responsibilities, scope, detail of cooperating agencies' contributions, and availability of pre-decisional information.

Cooperating agency status is provided in Table A-1. More specific details regarding federal agency roles and expertise are described below.

National Marine Fisheries Service

The National Marine Fisheries Service (NMFS) is serving as a cooperating agency pursuant to 40 CFR 1501.8 because the scope of the Proposed Action and alternatives involves activities that could affect marine resources under its jurisdiction by law and special expertise. As applicable, permits and authorizations are issued pursuant to the Marine Mammal Protection Act, as amended (MMPA) (16 United States Code [USC] 1361 et seq.); the regulations governing the taking and importing of marine mammals (50 CFR 216); the Endangered Species Act (ESA) (16 USC 1531 et seq.); and the regulations governing the taking, importing, and exporting of threatened and endangered species (50 CFR 222–226). In accordance with 50 CFR 402, NMFS also serves as the consulting agency under Section 7 of the ESA for federal agencies proposing actions that may affect marine resources listed as threatened or endangered and critical habitat. NMFS has additional responsibilities to conserve and manage fishery resources of the United States, which include the authority to engage in consultations with other federal agencies pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and 50 CFR 600 when proposed actions may adversely affect essential fish habitat (EFH). The MMPA is the only authorization for NMFS that requires NEPA compliance. NMFS intends to adopt BOEM's Final EIS if, after independent review and analysis, NMFS determines the Final EIS to be sufficient to support the authorization.

NMFS has multiple roles in the NEPA process and EIS for this major federal action. First, NMFS has a responsibility to serve as a cooperating agency based on its technical expertise and legal jurisdiction over multiple trust resources. NMFS's role is to provide expert advice regarding the action's impact with respect to EFHs, as defined in the MSA, listed threatened and endangered species and designated critical habitat listed under the ESA, marine mammals protected by the MMPA, and commercial and recreational fisheries managed under the MSA.

Second, NMFS intends to adopt the EIS in support of its MMPA authorization decision after reviewing it and determining it to be sufficient. NMFS is required to review applications for incidental take under the MMPA, as amended (16 USC 1361 et seq.) and issue an Incidental Take Authorization (ITA) in the form of a Letter of Authorization (LOA) for Incidental Take Regulations (ITRs) if appropriate. Revolution

Wind, LLC (Revolution Wind) has submitted an application to NMFS for an ITR in conjunction with the construction and operations plan (COP) for *take*, as defined by the MMPA, of marine mammals incidental to Project construction and associated activities. The decision to issue an ITR under the MMPA is considered a major federal action requiring NEPA review. Therefore, NMFS has an independent responsibility to comply with NEPA. Consistent with the regulations published by the CEQ (40 CFR 1501.7(g)), NMFS intends to rely on the information and analyses in BOEM's EIS to fulfill its NEPA obligations for ITA issuance, if applicable. NMFS intends to adopt the final EIS for this purpose.

The following list provides a timeline for NMFS-related Project documentation (BOEM 2023a, 2023b, 2023c, 2023d).

- Draft ESA biological assessment (BA) and EFH submitted to NMFS on April 25, 2022.
- NMFS provided comments on June 22, 2022.
- Revised ESA BA and EFH submitted on August 29, 2022.
- NMFS provided comments and requested changes on EFH on September 22, 2022.
- Revised ESA BA was submitted on November 1, 2022.
- NMFS deemed insufficient on November 11, 2022.
- BOEM submitted revised BA addendum on January 31, 2023.
- NMFS requested additional 60 calendar days to complete ESA and EFH consultations.
- BOEM submitted revised EFH consultation on February 7, 2023.
- NMFS determined EFH assessment complete on March 23, 2023.
- NMFS determined ESA consultation package complete on March 31, 2023.
- EFH consultation concludes on June 16, 2023.
- ESA consultation concludes on July 21, 2023.

NMFS published proposed ITA under MMPA on December 16, 2022.

NMFS proposed ITA under MMPA public comment period extended to February 7, 2023.

Bureau of Safety and Environmental Enforcement

The Bureau of Safety and Environmental Enforcement (BSEE) is serving as a cooperating agency pursuant to 40 CFR 1501.8 because the scope of the Proposed Action and alternatives involves activities that could affect marine resources under its jurisdiction by law and special expertise. BSEE's roles and responsibilities are outlined in 30 CFR 285.633 (BSEE and BOEM 2023).

U.S. Coast Guard

The U.S. Coast Guard (USCG) is serving as a cooperating agency pursuant to 40 CFR 1501.8 because the scope of the Proposed Action and alternatives involves activities that could affect navigation and safety issues that fall under its jurisdiction by law and special expertise. Upon lessee application, the USCG will issue a Private Aids to Navigation (PATON) permit for the marking and lighting of the wind turbine generators (WTGs), offshore substations (OSSs), and measurement buoys to alert mariners to potential hazards to navigation. A request for a Local Notice to Mariners (LNMs) publication will also be submitted to the USCG prior to vessel mobilization for construction activities to enable the USCG to issue the LNM.

U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (EPA) is serving as a cooperating agency pursuant to 40 CFR 1501.8 because the scope of the Proposed Action and alternatives involves activities that could affect resources under its jurisdiction by law and special expertise. The EPA is responsible for issuing an Outer Continental Shelf (OCS) permit for the Project under the Clean Air Act.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) is serving as a cooperating agency pursuant to 40 CFR 1501.8 because the scope of the Proposed Action and alternatives involves activities that could affect resources under its jurisdiction by law and special expertise. As applicable, permits and authorizations are issued pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act.

Section 10 of the Rivers and Harbors Act, approved on March 3, 1899 (33 USC 403), prohibits the unauthorized obstruction or alteration of any navigable water of the United States. The construction of any structure in or over any navigable water of the United States; the excavating from or depositing of material in such waters; or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. The instrument of authorization is designated a permit. The authority of the Secretary of the Army to prevent obstructions to navigation in navigable waters of the United States was extended to artificial islands, installations, and other devices located on the seafloor, to the seaward limit of the OCS, by Section 4(f) of the Outer Continental Shelf Lands Act of 1953, as amended (43 USC 1333(e)).

Section 404 of the Clean Water Act (33 USC 1344) authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits, after notice and opportunity for public hearing, for the discharge of dredged or fill material into the waters of the United States at specified disposal sites (see 33 CFR 323.) The selection and use of disposal sites will be in accordance with guidelines developed by the Administrator of the EPA in conjunction with the Secretary of the Army and published in 40 CFR 230.

The Section 10 activities associated with the Project may consist of the installation of WTGs, the installation of inter-array cables, the installation of export cables, and scour protection associated with the structures. Section 10 activities are regulated by the USACE between the mean high water-mark and the limits of the OCS. The Section 404 fill activities associated with the Project may consist of the placement of scour protection on the export cables, the redeposition of dredged material into the horizontal directional drilling (HDD) pits near the landfall site, the installation of temporary cofferdams, and any other temporary discharges of dredged or fill material associated with the installation of the export cable. Section 404 activities are regulated by the USACE between the high tide line and the 3-nautical-mile mark.

Issuance of Section 10 or Section 404 permits requires NEPA compliance, which will be met via adoption of BOEM's EIS and issuance of a record of decision (ROD).

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) is serving as a participating agency for the Project. The USFWS also serves as the consulting agency under Section 7 of the ESA for federal agencies proposing actions that may affect terrestrial resources listed as threatened or endangered, including species of concern. See the ESA section below for a summary of the ESA consultation to date with the USFWS. The USFWS deemed the ESA consultation package complete, and consultation was initiated on November 17, 2022. BOEM submitted additional information to USFWS via an addendum in January 2023 and via a revised addendum in April 2023. Consultation was completed on May 30, 2023.

National Park Service

The National Park Service (NPS) is serving as a participating agency because there are multiple important NPS resources within the Project vicinity, including the Block Island Southeast Light, Marble House, Ocean Drive Historic District, Bellevue Avenue Historic District, and The Breakers National Historic Landmarks (NHLs). There may also be Land and Water Conservation Fund State and Local Assistance Program sites impacted if more export cable locations are set. However, at this point in time the proposed cable landing at Quonset Business Park in North Kingstown, Rhode Island, is not expected to interact with any NPS units or program lands. Should any potential impacts to NPS units or program lands be identified and an NPS permit is required, the NPS will request a change to cooperating agency status under "jurisdiction by law" pursuant to 40 CFR 1501.8.

Consultations and Authorizations

The following section provides a summary and status of BOEM consultations and authorizations as part of the Project (ongoing, complete, and the opinion or finding of each consultation). Section 1.4 of the COP provides a discussion of other federal and state consultation processes being led by Revolution Wind (VHB 2023).

Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) requires that federal actions within and outside the coastal zone that have reasonably foreseeable effects on any coastal use or natural resource of the coastal zone be consistent with the enforceable policies of a state's federally approved coastal management program (CMP). On June 7, 2021, Revolution Wind submitted a federal consistency certification with the MA CZM and the RI CRMC per 15 CFR 930.76. The CZMA federal consistency regulations at 15 CFR 930.60(b) allow for a stay of the required review period, if mutually agreed upon by both the applicant and the state agency.

On July 2, 2021, MA CZM requested additional information deemed necessary to determine consistency with the enforceable policies of its approved CMP and entered into a mutual agreement with Revolution Wind to stay the review for 8 months, beginning on July 7, 2021, with MA CZM's review restarting on March 7, 2022. On March 7, 2022, both parties agreed to a second stay ending May 7, 2022. On August 8, 2022, both parties agreed to a third stay ending on October 12, 2022. On November 21, 2022, both parties agreed to a fourth stay ending February 12, 2023. On February 17, 2023, both parties agreed to a fifth stay ending March 23, 2023. On March 27, 2023, both parties agreed to a sixth stay ending on April 25, 2023.

On May 1, 2023, both parties agreed to a seventh stay ending on May 9, 2023. On May 10, 2023, MA CZM issued a federal consistency determination of concurrence for the RWF Project.

On October 21, 2021, RI CRMC also requested additional information deemed necessary to make a consistency determination. On October 29, 2021, RI CRMC and Revolution Wind entered into an agreement to stay the CRMC's CZMA review until September 17, 2022. On November 17, 2022, RI CRMC and Revolution Wind entered into a second agreement to stay the CRMC's CZMA review until January 20, 2023. On February 8, 2023, RI CRMC and Revolution Wind entered into a third agreement to stay the CRMC's CZMA review until March 14, 2023. On March 3, 2023, RI CRMC and Revolution Wind entered into a fourth agreement to stay the CRMC's CZMA review until April 11, 2023. On March 31, 2023, RI CRMC and Revolution Wind entered into a fifth agreement to stay the CRMC's CZMA review until April 25, 2023. On May 12, 2023, RI CRMC issued a federal consistency determination of concurrence for the RWF Project. The COP provides the necessary data and information under 15 CFR 930.58 (VHB 2023). The states' concurrence is required before BOEM could approve, or approve with conditions, the COP per 30 CFR 585.628(f) and 15 CFR 930.130(1).

Endangered Species Act

Section 7(a)(2) of the ESA of 1973, as amended (16 USC 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 NMFS or the USFWS, depending upon the jurisdiction of the agencies. Pursuant to 50 CFR 402.07, 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 the USFWS. BOEM is consulting on the proposed activities considered in this EIS with both NMFS and the USFWS for listed species under their respective jurisdictions. Draft biological assessments have been prepared for submission to USFWS and NMFS. USFWS ESA consultations are expected to be completed by March 31, 2023. NMFS ESA consultation is expected to be completed by July 21, 2023.

Government-to-Government Consultation with Federally Recognized Indian Tribes

Executive Order (EO) 13175 commits federal agencies to engage in government-to-government consultation with tribal nations. A June 29, 2018, memorandum outlines BOEM's current tribal consultation guidance (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 EO 13175 (BOEM 2018). BOEM implements tribal consultation policies through formal government-to-government consultation, informal dialogue, collaboration, and engagement.

Summaries of BOEM's consultation meetings with tribes are provided in this section and indicate which tribes were in attendance. BOEM invites multiple tribes, unless a one-to-one or follow-up meeting was requested by the tribe.

BOEM conducted government-to-government consultations with the Narragansett Indian Tribe, the Mashantucket (Western) Pequot Tribal Nation, and the Mohegan Tribe of Indians of Connecticut in an overview of planned offshore wind development projects off southern New England in August 2018.

Between January 15 and 17, 2020, BOEM met again with the Mohegan Tribe of Indians of Connecticut, the Mashantucket (Western) Pequot Tribal Nation, and the Narragansett Indian Tribe to discuss multiple BOEM actions in the Rhode Island/Massachusetts Wind Energy Area. Tribal representatives expressed concerns about possible effects on marine mammals, other marine life, and the Nantucket Sound Traditional Cultural Place (TCP). One concern emphasized the importance of open sea views to the east during sunrise, as well as the night sky, whereas others emphasized the long historical association of the tribes with the sea and islands off southern New England and the critical role of fishing and shellfish gathering for tribes. All of the tribes emphasized the importance of understanding the interconnected nature of the human world, the sea, and the living things in both worlds.

In July 2020, BOEM and the BSEE conducted meetings with the Mashantucket (Western) Pequot Tribal Nation, and the Mashpee Wampanoag Tribe. These meetings generally focused on developing mitigation measures for offshore wind project impacts, funding, and best practices. Concerns expressed by representatives from the tribes present included project effects and layout, a desire to redefine the Nantucket Sound TCP boundaries, recommendations for mitigation measures, aboriginal rights and titles, communication with developers, and cumulative effects of the present and future offshore wind projects in the area.

On August 20, 2020, BOEM consulted with the Delaware Tribe of Indians, Mashantucket (Western) Pequot Tribal Nation, Mashpee Wampanoag Tribe, and Wampanoag Tribe of Gay Head (Aquinnah) to discuss the impacts of offshore wind developments on marine mammals. This included an overview of the consultation process and environmental review, the BOEM Environmental Studies Program and process, existing and upcoming studies related to North Atlantic right whales, and the marine mammal analysis and findings noted in the Vineyard Wind 1 supplemental EIS. The meeting concluded with some action items for BOEM, including to provide the above-referenced consulting tribes with additional reports and to research funding options to provide tuition assistance for tribal members interested in participating in the Protected Species Observer training certificate program.

On April 9, 2021, BOEM held a government-to-government consultation meeting with representatives from the Delaware Tribe of Indians, Mashpee Wampanoag Tribe, and Wampanoag Tribe of Gay Head (Aquinnah). Most of the meeting focused on topics and issues applicable to offshore wind development. During the meeting, representatives from the tribes voiced concerns about potential impacts of area offshore wind projects to water quality; marine mammals; culturally and economically significant fisheries and shellfish populations; chemical pollutants; the financial and time burden on tribes of participating in multiple, simultaneous offshore wind project reviews; and preserving natural and cultural resources for future generations, particularly the current and future ability of tribal youth to perform sacred ceremonies and have safe havens for traditional cultural practices in the future. In addition to discussing these concerns, tribal representatives also recommended that BOEM consider creating shared offshore export cable corridors and requested that BOEM consult with federally recognized tribes on all proposed offshore wind projects as one large federal action rather than on a project-by project basis.

In April 2021, BOEM invited by individual letter and email the Mashpee Wampanoag Tribe, Shinnecock Indian Nation, Mashantucket (Western) Pequot Tribal Nation, Wampanoag Tribe of Gay Head (Aquinnah), Mohegan Tribe of Indians of Connecticut, Narragansett Indian Tribe, Delaware Tribe of Indians, and Delaware Nation to join the EIS process as cooperating agencies, to participate in scoping, to meet government-to-government on the Project, and to consult under NHPA Section 106. The invitations and the NOI for the Project notified tribes that BOEM would be using the NEPA substitution process for completing the steps of NHPA Section 106 pursuant to 36 CFR 800.8 (see National Historic Preservation Act section below). BOEM had earlier, in December 2020, notified the consulting tribes of its intent to apply this NEPA substitution process on its future offshore wind development reviews and held a workshop on this process open to tribes in January 2021.

On August 2, 2021, BOEM held a government-to-government meeting with the Wampanoag Tribe of Gay Head (Aquinnah) to discuss visual effects from the South Fork Wind Farm (SFWF) and RWF. The Wampanoag Tribe of Gay Head (Aquinnah) provided comments, and BOEM responses on the agency's tribal consultation practices to date on offshore wind development and the tribe's expressed concerns with the proximity of the SFWF and RWF lease areas and the consideration of alternatives.

On August 13, 2021, BOEM held a government-to-government meeting on RWF and Vineyard Wind South with the Mashpee Wampanoag Tribe, Mashantucket (Western) Pequot Tribal Nation, Wampanoag Tribe of Gay Head (Aquinnah), Delaware Tribe of Indians, and Delaware Nation. The meeting discussed BOEM's decision to use the NEPA substitution process for NHPA Section 106 compliance; cooperating agency status for tribes during NEPA EIS development; tribal land considerations on the OCS; power purchase agreements; BOEM's use of project design envelopes for project reviews; export cables; vessel traffic corridors; HDD at landfall sites; terrestrial archaeology; cumulative visual impacts; traditional cultural practices; potential impact to marine mammals; and project schedules and FAST-41.

On February 3, 2022, BOEM held a government-to-government meeting on RWF with the Mashpee Wampanoag Tribe, Mashantucket (Western) Pequot Tribal Nation, and Wampanoag Tribe of Gay Head (Aquinnah). The meeting discussed tribal land considerations on the OCS, export cables, terrestrial archaeology, marine archaeology, alternatives, cumulative visual impacts, Project schedule, and FAST-41.

On May 2, 2022, BOEM held a government-to-government meeting specifically with the chairwoman, tribal historic preservation office, and council members of the Wampanoag Tribe of Gay Head (Aquinnah). In the meeting, BOEM introduced and discussed the overall renewable energy program and process and summarized details and status of projects off the coast of New England. Topics identified for future discussion included cumulative visual simulations and resource impacts, the transmission process that is part of a lease, decommissioning process and oversight, proposed mitigation plans and agreements, and the tribal capacity building initiatives.

On June 1, 2022, BOEM held a government-to-government meeting with the chairwoman and council members of the Wampanoag Tribe of Gay Head (Aquinnah). This meeting was a follow-up to the May 2 meeting to continue the conversation on various topics and tribal concerns related to the Project as well as to offshore wind development off the New England coast collectively.

On June 2, 2022, the BOEM director met in-person with the Mashpee Wampanoag Tribe to provide the tribal council with an overview of the current state of wind farm permitting off the coast of New England, including Gulf of Maine; to discuss and receive feedback on the Project and regional biological and economic concerns and potential mitigation strategies; to discuss and receive feedback on cumulative visual impacts and simulations; and to discuss and receive feedback on other programmatic topics, including transmission as part of a lease and capacity building initiatives.

On January 24, 2023, and February 3, 2023, BOEM had virtual government-to-government meetings with members of the Mashpee Wampanoag Tribe, Wampanoag Tribe of Gay Head (Aquinnah), and Mashantucket (Western) Pequot Tribal Nation to give an update on the Project, and answer questions.

As part of COP development, Revolution Wind also engaged with tribes, State Historic Preservation Officers, and other stakeholders identified as having potential to inform the design process (see COP Appendix A [BOEM 2023e]).

Marine Mammal Protection Act

The MMPA was enacted to protect and conserve marine mammals and established a general moratorium on the taking and importation of marine mammals, with certain enumerated exceptions. Unless an exception applies, the act prohibits persons or vessels subject to the jurisdiction of the United States from taking any marine mammal in waters or on lands under the jurisdiction of the United States or on the high seas (16 USC 1372(a)(1), (a)(2)). Section 101(a) of the act provides the prohibitions for the incidental taking of marine mammals. The incidental take of a marine mammal falls under three categories: mortality, serious injury, or harassment (i.e., injury and/or disruption of behavioral patterns). Sections 101(a)(5)(A) and (D) of the act provide the exceptions to the prohibition on take, which give NMFS the authority to authorize the incidental but not intentional take of small numbers of marine mammals, provided certain determinations are made and statutory and regulatory procedures are met. Entities seeking to obtain authorization for the incidental take of marine mammals under NMFS jurisdiction must submit such a request (in the form of an application). ITAs may be issued as either 1) regulations and associated letters of authorization or 2) incidental harassment authorizations when a proposed action will not result in a potential for serious injury and/or mortality or where any such potential can be negated through required mitigation measures. NMFS also promulgated regulations to implement the provisions of the MMPA governing the taking and importing of marine mammals (50 CFR 216) and produced Office of Management and Budget (OMB)–approved application instructions (OMB Number 0648-0151) that prescribe the procedures necessary to apply for permits. All applicants must comply with these regulations and application instructions in addition to the provisions of the MMPA. Once NMFS determines an application is adequate and complete, NMFS has a corresponding duty to determine whether and how to authorize take of marine mammals incidental to the activities described in the application. To authorize the incidental take of marine mammals, NMFS evaluates the best available scientific information to determine whether the take would have a negligible impact on the affected marine mammal species or stocks and an unmitigable impact on their availability for taking for subsistence uses. NMFS must also prescribe the “means of effecting the least practicable adverse impact” on the affected species or stocks and their habitat, and on the availability of those species or stocks for subsistence uses, as well as monitoring and reporting requirements.

NMFS received an application for an ITR from Revolution Wind, which was deemed complete on February 28, 2022, and published in the *Federal Register* on March 21, 2022 (National Oceanic and Atmospheric Administration [NOAA] 2022a). Subsequently, the proposed rule for the taking of marine mammals incidental to implementation of the Revolution Wind Offshore Wind Energy Project was published in the *Federal Register* on December 23, 2022 (NOAA 2022b). As outlined above, NMFS reviews applications to determine whether to issue an authorization for the activities described in the application.

National Historic Preservation Act

The NHPA (54 USC 306108 et seq.) requires federal agencies to consider the effects of their undertakings on historic properties, to the maximum extent possible plan and act to minimize harm to NHLs, and afford the Advisory Council on Historic Preservation an opportunity to comment. BOEM has determined that approving a COP constitutes an undertaking subject to Section 106 of the NHPA and is implementing the Section 106 process (36 CFR 800). Effects to historic properties from the Project could be direct, indirect, and cumulative. The construction of WTGs, installation of electrical support cables, and development of staging areas are ground- or seafloor-disturbing activities that could directly affect archaeological resources. The presence of WTGs could also introduce visual elements out of character with the historic setting of historic structures or landscapes; in cases where historic setting is a contributing element of historic properties' eligibility for the NRHP, the Project could affect those historic properties, including NHLs. NHLs that may be affected by the undertaking will be addressed according to Section 110(f) of the NHPA pursuant to 36 CFR 800.10. Visual impacts to historic properties, in particular, could be cumulative when the Project adds to the visual impacts of other reasonably foreseeable offshore wind energy developments.

The regulations at 36 CFR 800.8 provide for use of the NEPA process to fulfill a federal agency's NHPA Section 106 review obligations in lieu of the procedures set forth in 36 CFR 800.3–800.6. This process is known as "NEPA substitution for Section 106," and BOEM is using this process and documentation prepared under NEPA to also comply with Section 106. Under NEPA substitution for Section 106 (NEPA Substitution), BOEM is using the public involvement requirements under NEPA to also seek public involvement in its Section 106 review, pursuant to 36 CFR 800.2(d)(3). EIS Appendix J includes BOEM's draft finding of adverse effect, which includes a description and summary of BOEM's consultation to date. BOEM will continue consulting with the Connecticut, Rhode Island, Massachusetts, and New York SHPOs; Advisory Council on Historic Preservation (ACHP); federally recognized tribal nations, and other consulting parties regarding the finding of adverse effect and the resolution of adverse effects. BOEM has and will be conducting Section 106 consultation meeting(s) on the finding of adverse effect and the resolution of adverse effects, and the agency will be requesting the consulting parties to review and comment on the finding of adverse effect and proposed resolution measures. Through NEPA Substitution, resolution of adverse effects will be documented in a memorandum of agreement (MOA) with the consulting parties, concluded prior to the issuance of the ROD.

Under the NEPA process, federally recognized tribes were invited to be cooperating agencies for the Project by BOEM, and officials with the Mashpee Wampanoag Tribe, Mashantucket (Western) Pequot Tribal Nation, and Wampanoag Tribe of Gay Head (Aquinnah) have attended select cooperating agency meetings to date. BOEM received comments from several tribes during June 2021 cooperating agency meetings in the scoping of alternatives and weighed these in the identification of alternatives to consider in detailed EIS analyses. The Mashantucket (Western) Pequot Tribal Nation and the Wampanoag Tribe of Gay Head (Aquinnah) also provided written comments for scoping. Comments received variously from tribes on alternatives included a co-located export cable corridor to be shared with other offshore projects and RWF setbacks and different configurations of WTG layouts to protect the environment (water, wildlife, and other natural and heritage resources) as well as to set back WTGs from land to address visual and cultural impact concerns. A setback option that would restrict/maximize the distance of WTGs from Massachusetts islands was formulated by BOEM in consultation with the Wampanoag Tribe of Gay Head (Aquinnah) and carried forward by BOEM to detailed analyses (i.e., Alternative E). A marine habitat alternative (Alternative C) was also carried forward to detailed analysis based on the comments of many consulting parties, including participating tribes. A draft scoping report was provided for cooperating agency review in June 2021, including to participating tribes.

BOEM fulfilled public involvement requirements for Section 106 of the NHPA through the NEPA public scoping and public meetings process, pursuant to 36 CFR 800.2(d)(3). The scoping summary report (SWCA Environmental Consultants [SWCA] 2022), available on BOEM's Project-specific website, summarizes comments on historic preservation issues. BOEM initiated review under NEPA Substitution on April 2, 2021, with letters sent to identify consulting parties for this undertaking between April 2 and 20, 2021. Letters were then sent between May 11 and 12, 2021, to initiate consultation with those parties previously identified for the undertaking. BOEM posted an additional notification for the public and historic properties owners, and sent letters to local administrators, with an invitation to consult following publication of BOEM's finding of adverse effect under NHPA Section 106 (see EIS Appendix J). BOEM will add additional consulting parties throughout the review process as they are identified. Lists of the consulting parties to date for the Project are provided in BOEM's finding of adverse effect and MOA documents in EIS Appendix J. BOEM held the following consultation meetings with consulting parties:

- An initial consultation meeting with consulting parties on December 17, 2021, to discuss the area of potential effects (APE) and the identification of historic properties within the APE
- A second consultation meeting with consulting parties on April 8, 2022, to discuss the identification of historic properties and potential effects on historic properties
- A third consultation meeting on September 27, 2022, to further discuss adverse effects and their resolution
- A consultation meeting with the Town of Aquinnah on December 5, 2022, focusing on mitigation of adverse effects to historic properties in that town
- A consultation meeting on December 14, 2022, with parties involved with NHLs to review and discuss Project visual effects to NHLs and treatment of adverse effects that would result in harm to NHLs
- A fourth consultation meeting on April 7, 2023, to discuss the identification of the Preferred Alternative, updates to technical reports, and the measures proposed by consulting parties in review of the MOA

Subsequent consultation meetings are anticipated in Q2 2023 and as needed prior to the issuance of the ROD for the purpose of finalizing and executing the MOA.

BOEM's final EIS includes treatment measures for resolving adverse effects to historic properties. The MOA details the final resolution measures to resolve adverse effects, including avoidance, minimization, and mitigation measures.

BOEM has consulted with the ACHP and coordinated with the NPS about a plan on how to handle sensitive information potentially subject to NHPA Section 304. From the beginning of the Section 106 consultation for the Project, BOEM has planned to distribute documents that contain sensitive information to the consulting parties and to post publicly available summaries or redacted versions of Section 106–related documents to BOEM's website. The documents could contain sensitive information on the location and character-defining elements of historic properties that could be subject to NHPA

Section 304—in particular, archaeological sites and sites of religious and cultural significance to tribes. Summaries were posted to BOEM's website for the Project shortly after the Draft EIS was made publicly available. EIS Appendix J contains BOEM's finding of adverse effect and the draft MOA documents, with certain sensitive information redacted. The NEPA scoping, hearings, and review have specifically included presentation of the non-confidential NHPA Section 106 process and information. BOEM notifications to the public on public hearings were posted in local media and newspapers. With respect to the timing of the Draft EIS public review period and the differing dates for technical document review by consulting parties under NHPA Section 106, BOEM believes that it was appropriate to give the consulting parties additional time to review the documents that it distributed to them on August 1, 2022, because supplemental information on NHLs was provided during the review period for the Section 106–related documents and reports on October 1, 2022. With this additional time, the consulting parties had a 90–calendar day review period for the Section 106–related documents from August 1 to October 31, 2022. BOEM elected not to extend the 45-day public comment period on the Draft EIS. Nothing under the NEPA and NHPA Section 106 coordination process under 36 CFR 800.8(c) precludes BOEM from providing consulting parties additional time to review documents specifically related to Section 106 consultation. BOEM has publicly posted the supplemental information on NHLs to the Project website and included the final versions of the finding of effect and MOA documents in the publicly available Final EIS.

In addition to the directives of NEPA and the NHPA, EO 13007 (Indian Sacred Sites) directs federal land management agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites. BOEM management actions within the OCS may not directly affect Indian sacred sites; however, BOEM recognizes its undertakings could affect the physical integrity or ceremonial use of Indian sacred sites located on submerged federal lands on the OCS. As stated previously in the Government-to-Government Consultation with Federally Recognized Indian Tribes section, BOEM is also consulting with Indian tribes on these matters in accordance with EO 13175.

Magnuson-Stevens Fishery Conservation and Management Act

Pursuant to Section 305(b) of the MSA, federal agencies are required to consult with NMFS on any action that may result in adverse effects on EFH. NMFS regulations implementing the EFH provisions of the act can be found at 50 CFR 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 act. Certain OCS activities authorized by BOEM may result in adverse effects on EFH and therefore require consultation with NMFS. BOEM is developing an EFH assessment concurrent with this EIS. As outlined in the Cooperating Agencies section above, NMFS deemed the EFH assessment from BOEM complete on March 31, 2023. The EFH consultation is expected to conclude on June 21, 2023 (BOEM 2023c, 2023d).

Public Involvement in Development of the Environmental Impact Statement

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

Scoping

On April 30, 2021, BOEM issued an NOI to prepare an EIS consistent with the regulations implementing NEPA (42 USC 4321 et seq.) to assess the potential impacts of the Proposed Action and alternatives (BOEM 2021a). The NOI initiated a public scoping period from April 30 through June 1, 2021. During this time, input from federal agencies, tribes, state and local governments, and the general public was gathered regarding the potential of significant resources and issues, impact-producing factors, reasonable alternatives (e.g., size, geographic, seasonal, or other restrictions on construction and siting of facilities and activities), and potential mitigation measures to be analyzed in the EIS as well as provide additional information.

A correction to the NOI was issued by BOEM on June 4, 2021, which reopened the public scoping period (BOEM 2021b), allowing for comments to be received by June 11, 2021. The correction addressed and clarified two statements in the NOI regarding the energy capacity of the proposed wind farm and its distance from shore.[1]

BOEM accepted comment submissions on the NOI via the following mechanisms:

- Electronic submissions received via www.regulations.gov on docket number BOEM-2021-0029
- Hard copy comment letters submitted to BOEM via traditional mail
- Emails submitted to BOEM
- Hard copy comment cards and/or letters received during each of the public scoping meetings
- Comments submitted verbally during the listening sessions of each of the three virtual public scoping meetings

BOEM held three virtual public scoping meetings on May 13, May 18, and May 20, 2021. Each virtual public scoping meeting included a presentation, listening session, and a question and answer session, all available on BOEM’s website at https://www.boem.gov/Revolution-Wind-Scoping-Virtual-Meetings.

Summary of Scoping Comments

BOEM reviewed and considered, as appropriate, all scoping comments in the development of the Draft EIS and used the comments to identify alternatives for analysis. The scoping summary report (SWCA Environmental Consultants 2022) summarizing the 42 submissions received and the methods for analyzing them is available on BOEM’s website at https://www.boem.gov/Revolution-Wind. In addition, all public scoping submissions received can be viewed online at http://www.regulations.gov by typing “BOEM-2021-0029” in the search field. As detailed in the scoping summary report, the resource areas or NEPA topics most referenced in the scoping comments include birds, marine mammals, effects analysis,

[1] Replaced the sentence “The project will deliver 704 MW of power to the New England energy grid.” with “The project would have the capacity to deliver up to 880 MW of power to the New England energy grid, satisfying the current PPA total of 704 MW.” Also replaced the sentence “The wind turbine generators, offshore substations, array cables, and substation interconnector cables would be located on the [Outer Continental Shelf] approximately 17.4 nautical miles (20 statute miles) south of the coast of Rhode Island.” with “The wind turbine generators, offshore substations, array cables, and substation interconnector cables would be located on the Outer Continental Shelf (OCS) approximately 15 nautical miles (18 statute miles) southeast of Point Judith, Rhode Island, approximately 13 nautical miles (15 statute miles) east of Block Island, Rhode Island, approximately 7.5 nautical miles (8.5 statute miles) south of Nomans Land Island National Wildlife Refuge (uninhabited island), and between approximately 10 to 12.5 nautical miles (12 to 14 statute miles) south/southwest of varying points of the Rhode Island and Massachusetts coastlines.”

socioeconomics, commercial fishing, mitigation, wildlife (general), bats, essential fish habitat and finfish, cumulative impacts, and sea turtles.

Distribution of the Draft Environmental Impact Statement for Review and Comment

On September 2, 2022, BOEM published a notice of availability (NOA) for the Draft EIS. The Draft EIS was made available in electronic format for public viewing at https://www.boem.gov/renewable-energy/state-activities/revolution-wind. Notification was provided, as indicated in Appendix K of the Draft EIS. Hard copies and digital copies of the Draft EIS were delivered to entities as requested. The NOA commenced the 45-day public review and comment period of the Draft EIS through October 17, 2022. BOEM held two virtual public hearings on September 29 and October 11 and three in-person public hearings on October 4–6 and 11, 2022, to solicit feedback and identify issues for consideration in preparing the Final EIS. Throughout the public review and comment period, government agencies, members of the public, and interested stakeholders had the opportunity to provide comments on the Draft EIS in various ways, including the following:

- In hard copy form, delivered by mail, and enclosed in an envelope addressed to Program Manager, Office of Renewable Energy Programs, Bureau of Ocean Energy Management, 45600 Woodland Road, Sterling, Virginia 20166
- Through the regulations.gov online portal by navigating to https://www.regulations.gov/, searching for docket number "BOEM-2022-0045," and submitting a comment
- By attending one of the public hearings on the dates listed in the NOA and providing written or verbal comments

BOEM reviewed and considered all comment submissions in the development of the Final EIS, except those from anonymous sources. BOEM's evaluation of public submissions focused on those comments within the submissions that were identified as substantive. EIS Appendix L describes the public comment processing methodology and includes comment responses. All public comment submissions received on the Draft EIS can be viewed online at https://www.regulations.gov/ by typing "BOEM-2022-0045" in the search field. BOEM received 123 individual comment letters via https://www.regulations.gov/ and 916 individual comments that are summarized and responded to in Appendix L.

Distribution of the Final Environmental Impact Statement

The EIS is available in electronic form for public viewing at https://www.boem.gov/renewable-energy/state-activities/revolution-wind. Hard copies and digital copies of the Final EIS can be requested by contacting Program Manager, Office of Renewable Energy Programs, Bureau of Ocean Energy Management, 45600 Woodland Road, Sterling, Virginia 20166. Publication of the Final EIS initiates a minimum 30-day mandatory waiting period, during which BOEM is required to pause before issuing a ROD. The ROD will state clearly whether BOEM intends to approve, approve with conditions, or disapprove the COP for construction, O&M, and eventual decommissioning of the Project. Distribution will be provided as indicated in Appendix H of the Final EIS.

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APPENDIX B

List of Preparers and Reviewers, References Cited, and Glossary

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Tables

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LIST OF PREPARERS AND REVIEWERS

Table B-1. Bureau of Ocean Energy Management Contributors

Name	Role/Resource Area
National Environmental Policy Act (NEPA) Coordinator	
Olivier, Trevis	NEPA coordinator
Segarra, Katherine	NEPA coordinator
Wolfson, Laura Lee	NEPA coordinator
Resource Scientists and Contributors	
Baker, Arianna	Navigation and vessel traffic; military uses
Bedard, Justin	Cultural resources; government-to-government consultation
Bhandari, Doleswar	Socioeconomics
Bigger, David	Birds; bats; coastal habitats; terrestrial and coastal fauna; wetlands; USFWS Endangered Species Act (ESA) consultation
Caporaso, Alicia	Benthic resources
Carrier, Brandi	Project coordinator
Chaiken, Emma	Commercial fisheries, economics, and for-hire recreational fishing
Chaky, Sindey	Land use and coastal resources
Charpentier, Nicole	Coastal Zone management Act coordinator
Conrad, Alexander	Marine acoustics and sound exposure
Cornelison, Meghan	Environmental justice
Damour, Melanie	Navigation and vessel traffic; visual resources
de Zeeuw, Maureen	Birds; bats; coastal habitats
Glenn, Tre	Marine mammals; sea turtles; birds; bats; National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) ESA consultation
Hauer, Whitney	Project coordinator
Heinze, Martin	Demographics, employment, and economics
Hesse, Jeffrey T.	Military uses
Houghton, Bonnie	Military uses
Howson, Ursula	NOAA NMFS essential fish habitat (EFH) consultation
Jensen, Mark	Demographics, employment, economics, recreation and tourism
Johnson, Stacey	NEPA compliance
Jones, Douglas	Cultural resources; government-to government consultations
Lilley, Meredith	Project coordinator
Luton, Harry	Environmental justice; land use; recreation and tourism

Name	Role/Resource Area
McCarty, John	Recreation and tourism; visual resources
Merritt, Stacie	Air quality
Miller, Jennifer	Alternatives, geophysical, cable burial and routing
Morin, Michelle	Chief, Environment Branch for Renewable Energy; NEPA compliance
Moshier, Marissa	Cultural resources, Section 106 consultations
Nord, Beth	Marine mammals; sea turtles
Oliver, Liz	Tribal liaison
Ren, Cholena	Air quality
Reuther, Dustin	Environmental justice, land use, recreation and tourism
Schiff, John	Water quality
Slayton, Ian	Cumulative impacts; air quality
Sorset, Scott	Cultural resources
Stokely, Sarah	Cultural resources; Section 106 consultations
Steen, Mariana	Benthic resources; invertebrates; finfish and essential fish habitat; NOAA NMFS EFH consultation
Stromberg, Jessica	Project coordinator and chief, Environment Branch for Renewable Energy; NEPA compliance
Sullivan, Kimberly	Environmental justice
Vaughn, Sarah	Water quality
White, Timothy	Birds; bats
Wisman, Jeri	Birds; bats; terrestrial and coastal fauna; wetlands; USFWS ESA consultation
Wolf, Jacob	Air quality

Table B-2. Reviewers

Name	Title	Agency
Brown, William	Chief Environmental Officer	U.S. Bureau of Ocean Energy Management (BOEM)
Segarra, Katherine	NEPA Coordinator	BOEM
Olivier, Trevis	NEPA Coordinator	BOEM
Wolfson, Laura Lee	NEPA Coordinator	BOEM
Giordano, Juliette	Lead Environmental Protection Specialist	Bureau of Safety and Environmental Enforcement
Baker, Arianna	Renewable Energy Policy Specialist	BOEM

Name	Title	Agency
Hildreth, Emily	Renewable Energy Policy Specialist	BOEM
Melendez-Arreaga, Pedro	Solicitor	U.S. Department of the Interior, Office of the Solicitor
Sarver, Kathryn	Solicitor	U.S. Department of the Interior, Office of the Solicitor
Vorkoper, Stephen	Solicitor	U.S. Department of the Interior, Office of the Solicitor
Timmerman, Timothy	Director	U.S. Environmental Protection Agency Region 1, Office of Environmental Review
Engler, Lisa	Director	Massachusetts Office of Coastal Zone Management
Hooker, Brian	Endangered Species Subject Matter Expert	BOEM
Crocker, Julie	Endangered Fish Branch Chief, GARFO Protected Resources Division	National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS)
Tuxbury, Susan	Fishery Biologist/Wind Program Coordinator, GARFO Habitat and Ecosystems Services Division	NOAA NMFS
Gray, Terry	Acting Director	Rhode Island Department of Environmental Management (RIDEM)
Amerault, Suzanne	Assistant to the Acting Director	RIDEM
Willis, Jeffrey	Acting Executive Director	Rhode Island Coastal Resource Management Council
Handell, Naomi	Project Manager, USACE, New York District Regulatory Branch-Eastern Section	U.S. Army Corps of Engineers (USACE)
Jacek, Christine	Project Manager, USACE New England District	USACE
Brien, Ruthann	Project Manager, USACE New England District	USACE
Detweiler, George	Team Leader, Office of Navigation Standards	U.S. Coast Guard (USCG)
Desautels, Michele	District 1 Agency Point of Contact	USCG

Table B-3. Consultants

Name	Role/Resource Area
Project Management/Coordinators	

Name	Role/Resource Area
Fluder, Joseph; SWCA	Corporate sponsor
Kloepfer, Robert; SWCA	Project sponsor
Hartmann, Christine; SWCA	Project manager; all sections
Wilmot, Susan; SWCA	Deputy project manager; all sections
Smith, Earl; SWCA	Geographic information systems
Diais, Madeline; SWCA	Administrative record, executive summary, appendices
Subject Matter Experts	
Berger, Chris; Confluence Environmental Company, Inc. (Confluence)	Sea turtles
Bockey, Chris; SWCA	Visual resources
Bush, Diane; SWCA	Editor
Clapsaddle, Madison; SWCA	Appendices
Cziesla, Chris; Confluence	Marine mammals, sea turtles
Doyle, Eric; Confluence	Benthic resources; invertebrates; EFH/finfish; marine mammals; sea turtles; other marine uses; land use and coastal infrastructure
Douglas, Calvin; Confluence	EFH/finfish
Faulkner, Geneva; Confluence	Land use and coastal infrastructure; other marine uses
Fisher, Michael; Northern Economics, Inc. (NEI)	Navigation and vessel traffic
Giblin, Kara; SWCA	Wetlands and non-tidal waters
Gilmer, Anna; SWCA	Cultural resources
Guest, Joanna; SWCA	Air quality
Hartley, Marcus; NEI	Commercial fisheries and for-hire recreational fishing; Demographics, employment, and economics
Himmelstein, Ashley; R. Christopher Goodwin & Associates (RCGA)	Cultural resources—marine archaeology
Hogel, Adrian; SWCA	Bats; birds; coastal habitats and fauna; wetlands and non-tidal waters
Huyhn, Alexis; Confluence	EFH/finfish, GIS support
Klewicki, Laura; SWCA	Water quality
Linehan, Kerri; SWCA	Editor
Maymon, Jeffrey; RCGA	Cultural resources—marine archaeology
McDonald, Kelly; Confluence	Marine mammals; GIS support
Medeiros, Melanie; SWCA	Cultural resources

Name	Role/Resource Area
Nixley, Todd; Confluence	Land use and coastal infrastructure; GIS support; other marine uses
Novak, Grant; Confluence	Benthic resources; invertebrates; EFH/finfish; marine mammals; sea turtles; other (marine) uses; land use and coastal infrastructure
Phillips, Scott; SWCA	Cultural resources—terrestrial resources, terrestrial archaeology, historic architecture, viewshed resources; tribal consultation
Sato, Irene; Confluence	Marine mammals
Schug, Donald; NEI	Commercial fisheries and for-hire recreational fishing; environmental justice
Smith, Debbi; SWCA	Formatter and 508 specialist
Sohm, Brad; SWCA	Air quality
Soncarty, Chris; Confluence	Marine mammals; sea turtles; biological assessments; EFH/finfish
Tucker Burfitt, Linda; SWCA	Editor
Wheeler, Letitia; Confluence	Land use and coastal infrastructure; other marine uses
Wilmot, Sue; SWCA	Recreation and tourism; water quality
Witzens, Kelcie; SWCA	Formatter and 508 specialist

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GLOSSARY

Term	Definition
affected environment	Environment as it exists today that could be impacted by the proposed Project
ancient submerged landform feature	A landform as it was in ancient times
algal blooms	Rapid growth of the population of algae, also known as algae bloom
allision	A moving ship running into a stationary ship
anthropogenic	Generated by human activity
applicant	Revolution Wind, LLC
archaeological resource	Historical place, site, building, shipwreck, or other archaeological site on the American landscape
automatic identification system	Automatic tracking system used on vessels to monitor ship movements and avoid collision
baleen whale	A cetacean with baleens (whalebones) instead of teeth
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 within these habitats
Cetacea	Order of aquatic mammals made up of whales, dolphins, porpoises, and related lifeforms
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
coastal zone	The lands and waters starting at 3 nautical miles from the land and ending at the first major land transportation route
cofferdam	A watertight enclosure pumped dry to permit construction work below the waterline
commercial fisheries	Areas or entities raising and/or catching fish for commercial profit
commercial-scale wind energy facility	Wind energy facility usually greater than 1 megawatt that sells the produced electricity
criteria pollutant	One of six common air pollutants for which the U.S. 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 threated or endangered species. This is a specific term and designation within the U.S. Endangered Species Act.
cultural resource	Historical districts, objects, places, sites, buildings, shipwrecks, and archeological sites on the American landscape, as well as sites of traditional, religious, or cultural significance to cultural groups, including Native American tribes

Term	Definition
cumulative impacts	Impacts that could result from the incremental impact of a specific action, such as the proposed Project, when combined with other past, present, or reasonably foreseeable future actions or other projects; can occur from individually minor, but collectively significant actions that take place over time
demersal	Living close to the ocean floor
design envelope	The range of proposed Project characteristics defined by the applicant and used by the Bureau of Ocean Energy Management (BOEM) for purposes of environmental review and permitting
dredging	Removal of sediments and debris from the bottom of lakes, rivers, harbors, and other water bodies
duct bank	Underground structure that houses the onshore export cables, which consists of polyvinyl chloride (PVC) pipes encased in concrete
ecosystem	Community of interacting living organisms and nonliving components (such as air, water, soil)
environmental protection measure (EPM)	Measure proposed in a COP to avoid or minimize potential impacts
electromagnetic field	A field of force produced by electrically charged objects and containing both electric and magnetic components
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
ensonified	The process of filling with sound
environmental consequences	The potential impacts that the construction, operations, maintenance, and decommissioning of the proposed Project would have on the environment
environmental justice communities	Minority and low-income populations affected by the proposed Project
essential fish habitat	"Those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (50 Code of Federal Regulations 600)
export cables	Cables connecting the wind facility to the onshore electrical grid power
finfish	Vertebrate and cartilaginous fishery 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 make a contribution 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

Term	Definition
foundation	The bases to which the wind turbine generators and offshore substation are installed on the seabed. Five alternative foundation designs were considered and reviewed for the Project (Section 2.2.2.2 of the COP): monopile; piled three-, four-, or six-legged jacket; suction caisson jackets; monopod suction caisson; or gravity-based structure. Monopile is the selected foundation type for the Project.
hard-bottom habitat	Benthic habitats comprised of hard-bottom (e.g., cobble, rock, and ledge) substrates
historic property	Prehistoric or historic district, site, building, structure, or object that is eligible for or already listed in the National Register of Historic Places. 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
inter-array cables	Cables connecting the wind turbine generators to the offshore substations
interconnection facility	Substation connecting the proposed Project to the existing bulk power grid system
invertebrate	Animal with no backbone
jack-up vessel	Mobile and self-elevating platform with buoyant hull
jet plow	Method of submarine cable installation equipment that primarily uses water jets to fluidize soil, temporarily opening a channel to enable the cable to be lowered under its own weight or be pushed to the bottom of the trench via a cable depressor.
knot	Unit of speed equaling 1 nautical mile per hour
landing site	The shoreline landing site at which the offshore cable transitions to onshore
Lease Area	The entire area that Revolution Wind, LLC purchased from BOEM. The RWF must be within the Lease Area.
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
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.
monopile or monopile foundation	A long steel tube driven into the seabed that supports a tower

Term	Definition
National Ambient Air Quality Standards	Limits on atmospheric concentration of six criteria pollutants that are common in outdoor air and considered harmful to public health and the environment as established by the U.S. Environmental Protection Agency under authority of the Clean Air Act.
nautical mile	A unit used to measure sea distances and equivalent to approximately 1.15 miles
offshore Revolution Wind Export Cable	Export cables located in state or federal waters
offshore substation	The interconnection point between the wind turbine generators and the export cable; the necessary electrical equipment needed to connect the inter-array cables to the offshore export cables
onshore transmission cable	Export cables located on land
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
pile	A type of foundation akin to a pole
pile driving	Installing foundation piles by driving them into the seafloor
pinnipeds	Carnivorous, semiaquatic, fin-footed marine mammals, also known as seals
plume	Column of fluid moving through another fluid
private aids to navigation	Visual references operated and maintained by the U.S. Coast Guard, including radar transponders, lights, sound signals, buoys, and lighthouses, that support safe maritime navigation
Project	The siting and development of the Revolution Wind Farm and the Revolution Wind Export Cable
protected species	Endangered or threatened species that receive federal protection under the Endangered Species Act of 1973 (as amended)
right-of-way	Registered easement on private or government land that allows access by another entity. For purposes of renewable energy development of the Outer Continental Shelf (OCS), BOEM defines a right-of-way grant as an authorization issued by BOEM under 30 CFR 585 Subpart B to use a portion of the OCS for the construction and use of a cable or pipeline for the purpose of gathering, transmitting, distributing, or otherwise transporting electricity or other energy product generated or produced from renewable energy but does not constitute a project easement under Subpart B. The term also means the area covered by the authorization.
ruderal	Growing on waste ground or among refuse
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
sessile	Attached directly by the base

Term	Definition
soft-bottom habitat	Benthic habitats include soft-bottom (i.e., unconsolidated sediments) and hard-bottom (e.g., cobble, rock, and ledge) substrates, as well as biogenic habitat (e.g., eelgrass, mussel beds, and worm tubes) created by structure-forming species
Revolution Wind Farm (RWF)	The work area containing all proposed wind turbine generators, offshore substations, and inter-array cables
substrate	Earthy material at the bottom of a marine habitat; the natural environment that an organism lives in
suspended sediments	Very fine soil 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, and/or by suspension.
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
transition vault	Underground concrete transition vault that to be constructed at the landing site and inside of which offshore and shore South Fork Export Cable would be spliced together.
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
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 manmade structures
wetland	Land saturated with water; marshes; swamps
wind energy	Electricity from naturally occurring wind
wind energy area	Areas with significant wind energy potential and defined by BOEM
wind turbine generator	Component that puts out electricity in a structure that converts kinetic energy from wind into electricity

APPENDIX C

Incomplete or Unavailable Information

Contents

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Introduction

In accordance with Section 1502.21[1] of the Council on Environmental Quality 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 there is incomplete or unavailable information, the agency shall make clear that such information is lacking.

Given the substantial geographic and temporal scale of the cumulative impacts analysis for the Revolution Wind Farm (RWF) and Revolution Wind Export Cable Project (Project), some information regarding ongoing activities is unavailable or only available in qualitative or summary form—in particular, for many offshore resources. Concerning reasonably foreseeable construction and operations plans (COPs), specific information is available only for COPs that have been submitted for Bureau of Ocean Energy Management (BOEM) review and are publicly available (see Appendix E of the EIS). Given that information is lacking for other offshore wind activities considered reasonably foreseeable, and several of the COPs submitted are currently under review to determine whether they contain complete and sufficient information for environmental review, a series of assumptions were necessary to conduct the cumulative impacts analysis as outlined in Appendix E3, Table E3-1. Although these assumptions were necessary to allow the analysis to proceed with a reasonable degree of certainty, it is not known whether or to what extent future offshore wind activities will proceed according to these assumptions.

In addition to the uncertainty regarding future activities contemplated in the cumulative analysis, there is also incomplete or unavailable information regarding the likely consequences of various activities on the resources analyzed. When incomplete or unavailable information was identified, BOEM considered whether the information was relevant to the assessment of impacts and essential to a reasoned choice among alternatives. If essential to a reasoned choice among the alternatives, BOEM considered whether it was possible to obtain the information and if the cost of obtaining it was unreasonable. If information could not be obtained within the time frame needed for this analysis or because of exorbitant costs, BOEM applied acceptable scientific methodologies to inform the analysis in light of this incomplete or unavailable information. For example, conclusive information on many impacts of the offshore wind industry may not be available for years and would therefore not be available within the contemplated time frame of this NEPA process. In its place, subject matter experts have used the scientifically credible information available and accepted scientific methodologies for proxy indicators or data to evaluate impacts on the resources while this information is unavailable.

Incomplete or Unavailable Information Analysis for Resource Areas

Air Quality

Any action alternative for the Project would lead to air quality impacts that range from **negligible** to **moderate** and **minor** beneficial. Although a quantitative emissions inventory analysis of the region over the next 35 years has not been completed, the EIS does disclose annual emissions that could have been

[1] 40 Code of Federal Regulations 1502.22 in Council on Environmental Quality regulations implementing NEPA prior to September 14, 2020.

avoided by using non–fossil fuel energy sources within the air quality geographic analysis area, as well as the health impacts from those avoided emissions. In addition, the differences among action alternatives with respect to direct emissions due to construction and installation, operations and maintenance (O&M), and decommissioning of the Project would likely be small. For this reason, the analysis provided in the EIS is sufficient to support sound scientific judgements and informed decision making related to the use of onshore and offshore portions of the air quality geographic analysis area. In summary, BOEM did not identify incomplete or unavailable information on air quality that is essential to a reasoned choice among alternatives.

Bats

Habitat use and distribution vary between season and species, and as a result, there will always be some level of incomplete information on the distribution and habitat use of migratory bats in the offshore portions of the bat geographic analysis area. In addition, because U.S. offshore wind is in its infancy, with three offshore wind projects (Block Island Wind Farm, Virginia Commercial Offshore Wind, and Vineyard Wind Farm) having been or currently being constructed at the time of this analysis, there is some level of uncertainty regarding the potential collision risk to individual bats that may be present within the offshore portions of the geographic analysis area. However, empirical data, including regional bat acoustic studies conducted from coastal, island, vessel, or offshore structure locations and regional telemetry data from recent studies focusing on listed species, were used to assess the likelihood of offshore occurrence, seasonal patterns, and bat species composition.

Information on collision risk to migratory bats is also available from observations collected at land-based U.S. wind facilities, and based on a number of assumptions regarding the applicability to offshore environments, this information was used to analyze and evaluate the potential for collisions associated with the wind turbine generators (WTGs) analyzed in the EIS. In addition, and as described in Section 3.5.1 of the EIS, the likelihood of an individual migratory bat encountering the rotor swept zone of one or more operating WTGs is negligible. For this reason, the analysis provided in the EIS is sufficient to support sound scientific judgments and informed decision making related to the distribution and use of the offshore portions of the geographic analysis area, as well as to the potential for collision risk of migratory bats. Further, the similarity between the layouts analyzed for the different alternatives does not render any of this incomplete and unavailable information essential to a reasoned choice among alternatives. Therefore, BOEM did not identify incomplete or unavailable scientifically based information on bat resources that is essential to a reasoned choice among alternatives.

Benthic Habitat and Invertebrates

Although there is some uncertainty regarding the temporal distribution of benthic resources and periods during which they might be especially vulnerable to disturbance, site-specific benthic habitat mapping by Inspire Environmental (2021) and other broadscale studies (e.g., Fugro 2019, 2021; Guida et al. 2017; Stantec 2020) provided a suitable basis for predicting the species, community composition, and distributions of benthic resources in the geographic analysis area. Some uncertainty also exists about the effects of some impact-producing factors (IPFs) on benthic resources. For example, the available information on invertebrate sensitivity to electromagnetic fields (EMFs) is equivocal (Hutchinson et al. 2020), and sensitivity to sound pressure and particle motion effects is not well understood for all species (e.g., squid sensitivity to vibration effects transmitted through sediments). However, information from monitoring studies of European wind facilities and, more recently, the Block Island Wind Farm in the United States provides no indication of biologically significant adverse effects. There is broader uncertainty about the long-term effects of changes in biological productivity resulting from the creation of new habitat types on the mid-Atlantic Outer Continental Shelf (OCS) in the form of a distributed network of artificial reefs. The widespread development of offshore renewable energy facilities would, however, create a distributed network of artificial reefs on the mid-Atlantic OCS. These reefs form biological hotspots that could support species range shifts and expansions, nonnative species, and changes in biological community structure (Degraer et al. 2020; Methratta and Dardick 2019; Raoux et al. 2017). The nature and significance of secondary synergistic effects, such as changes in diet and predator-prey interactions resulting from habitat modification in combination with other IPFs, are not fully known. Lastly, the nature, extent, and significance of potential spillover effects on broader ecosystem functions, such as larval dispersal, are not fully understood (van Berkel et al. 2020).

As stated, ongoing monitoring studies at European wind facilities and the Block Island Wind Farm in the United States provide a useful basis for evaluating the combined effects of these IPFs on the biological community as a whole, even if effects on individual species cannot be predicted with specificity. On balance, the current scientific information is sufficient to support sound scientific judgements and informed decision making because relevant studies monitoring changes at wind farms have not observed significant changes to finfish over years of study. Further, the similarity between the layouts analyzed for the different alternatives does not render any of this incomplete and unavailable information essential to a reasoned choice among alternatives. Therefore, BOEM did not identify incomplete or unavailable information that is essential to a reasoned choice among alternatives. There is uncertainty regarding the spatial and temporal occurrence of invertebrates throughout the entire benthic habitat and invertebrates geographic analysis area. However, broadscale information is available from sources such as federal fisheries management plans (FMPs) and surveys completed to support COP submission. There is also uncertainty regarding behavioral effects from each IPF individually and cumulatively. Again, BOEM is able to draw on existing scientific findings, as presented in Section 3.6 of the EIS and references therein. The available information is suitable for characterizing the likely effects of each IPF and has been used to analyze potential impacts resulting from the proposed Project and past, present, and reasonably foreseeable actions. Therefore, BOEM concludes that the available information about potential impacts on benthic habitats supports a reasoned choice among alternatives.

Birds

Habitat use and distribution of birds vary between seasons, species, and years, and as a result, there will always be some level of incomplete information on the distribution and habitat use of birds in the offshore portions of the birds geographic analysis area. However, survey findings for the Project (see COP Appendix K [*Onshore Natural Resources and Biological Assessment*] [VHB 2023]) were used to inform the predictive models and analyze the potential adverse impacts on bird resources in the EIS. In addition, because U.S. offshore wind is in its infancy, as described above for bats, there will always 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.

Bird mortality data are available for onshore wind facilities, and based on a number of assumptions (described in Section 3.7 of the EIS) regarding their applicability to offshore environments, these data were used to inform the analysis of bird mortality associated with the offshore WTGs analyzed in the EIS. However, uncertainties exist regarding the use of the onshore bird mortality rate to estimate offshore bird mortality rate because of differences in species groups present, the life history and behavior of species, and the differences in the offshore marine environment compared to onshore habitats. Similarly, the U.S. Fish and Wildlife Service biological assessment (BA) (BOEM 2022, 2023a) also provides an estimate of potential mortality using the Band (2012) collision risk model for Endangered Species Act species. Modeling is commonly used to predict the potential mortality rates for marine bird species in Europe and the United States (BOEM 2015, 2022). Because of inherent data limitations, these models often represent only a subset of species potentially present. However, the datasets used by both Revolution Wind, LLC (Revolution Wind), and BOEM to assess the potential for exposure of birds to offshore wind activities represent the best available data and provide context at both local and regional scales. Further, sufficient 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 the Project (e.g., Petersen et al. 2006; Skov et al. 2018). For this reason, the analysis provided in the EIS is sufficient to support sound scientific judgements and informed decision making related to distribution and use of the offshore portions of the analysis area, as well as to the potential for collision risk and avoidance behaviors in bird resources. Further, the similarity between the layouts analyzed for the different alternatives does not render any of this incomplete and unavailable information essential to a reasoned choice among alternatives. Therefore, BOEM did not identify incomplete or unavailable information on bird resources that is essential to a reasoned choice among alternatives.

Coastal Habitats and Fauna

Although the preferred areas of coastal habitats and associated fauna are generally known, exact abundances and distributions of various fauna are likely to remain unknown for the foreseeable future. However, the species inventories and other information from nearby areas provide an adequate basis for evaluating the fauna likely to inhabit the coastal habitat and fauna geographic analysis area. Additionally, the onshore activities proposed involve only common, industry-standard activities for which impacts are generally understood. For this reason, BOEM identified no incomplete or unavailable information required to conduct the impact assessment or to make a reasoned choice among alternatives.

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 fisheries information used in this assessment has limitations. For example, vessel trip report data are only an approximation because they are self-reported, and available historical data lack consistency, making comparisons challenging. However, these data do represent the best available data, and sufficient information exists to support the findings presented herein.

A second limitation is that aggregated geographic information system (GIS)–based data is necessary to fully update the revenue intensity figures. EIS Figures G-CF1 through G-CF13 in Appendix G provide low-resolution images of revenue intensity by FMP and provide graphic representations of the distribution of fishing efforts near the Lease Area for the years shown. However, similar revenue intensity figures are not available for ports or gear. Although the analysis in EIS Section 3.9 refers to these figures, annual vessel trip report data for 2008 to 2019 from the Greater Atlantic Regional Fisheries Office (GARFO) (2021) were the primary sources of data used in the tables throughout the assessment. These tables in EIS Section 3.9 summarize harvests and revenues by FMP, by ports, and by gears within the RWF and Revolution Wind Export Cable. Although additional revenue intensity figures would augment information provided in the analysis, BOEM determined this information is not essential to a reasoned choice among alternatives.

Cultural Resources

BOEM is applying NEPA Substitution for the steps in the National Historic Preservation Act Section 106 process under 36 Code of Federal Regulations 800.8, facilitating BOEM's good faith effort to identify historic properties and assess effects prior to construction. The record of decision (ROD) will apply to the alternative(s) selected by BOEM. BOEM will execute a memorandum of agreement before issuing the ROD and would require that the memorandum of agreement specify that measures for avoiding, minimizing, and mitigation adverse effects to historic properties be implemented for the selected alternative following ROD issuance. Therefore, BOEM has not identified incomplete or unavailable information on cultural resources that is essential to a reasoned choice among alternatives.

Demographics, Employment, and Economics

Estimates of local employment and income resulting from development and construction of the Project may be underestimated because the broadly used model to project the employment impacts of offshore wind energy development—the Jobs and Economic Development Impact Offshore Wind Model (JEDI-OWM) developed by the National Renewable Energy Laboratory (NREL)—has not been updated to include recent developments within the U.S. offshore wind component manufacturing and fabrication industry, despite NREL's recent updates to capital cost estimation portions of the JEDI-OWM.[2]

The COP and COP appendices do provide estimates of a capital and operating cost of a single configuration of RWF (with 89 8-megawatt [MW] WTGs and a nameplate capacity of 712 MW) along with an estimate of economic impacts to the United States and local economies of Rhode Island and Connecticut based on the 2017 version of the JEDI-OWM. It is presumed that Revolution Wind provided specific guidance to their economic analysts with respect to technical and cost parameters, as well as United States and local spending coefficients for this assessment. However, most of the specific technical details of the assessment were not provided to BOEM or to the authors of the EIS. Therefore, estimates of economic impacts of the development and construction of RWF under the range of EIS alternatives rely heavily on the economic impacts developed in the COP relative to estimates of capital and operating costs of the single configuration provided.

Because Revolution Wind provided the baseline estimates of economic impacts of the Project, and because other information from NREL's updated JEDI-OWM model[2] provides current estimates of

[2] An updated version of JEDI-OWM was made available in 2021. The portions of the JEDI-OWM used to estimate capital operational costs have been updated and include cost estimates of large WTGs (12 MW and 15 MW) that are likely to be employed in future offshore windfarms. However, the 2021 version of the model does not provide local purchase coefficients that are needed to estimate economic impacts. In addition, NREL has not yet published a user manual or a methodological report for the 2021 version. The economic impact estimates used in the demographic, employment, and economics section of the EIS are augmented by improved capital cost estimates in the new release, but continue to employ U.S. and local spending patterns included in the 2017 version of the JEDI-OWM.

capital costs of offshore wind farms with WTGs ranging up to 15 MW, BOEM determined that the lack of directly provided information with respect to other configurations is not essential to a reasoned choice among alternatives.

There is also uncertainty regarding the distribution of economic impacts among geographic areas, income brackets, and other sub-components of the economy. These effects will depend on how the Project supply chain evolves, the contracts that are ultimately entered into, and provisions with the Project's power purchase agreements and state laws. Much of this uncertainty is inherent at this stage of the Project. In addition, BOEM has used appropriate methods to estimate economic impacts given the available information. Therefore, additional information regarding the distribution of impacts among sub-components of the economy is not essential to a reasoned choice among alternatives.

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 document, also affect the completeness of the analysis of impacts on environmental justice communities. However, BOEM has determined that the incomplete and unavailable resource information summarized in this appendix was either not relevant to a reasoned choice among alternatives or the alternative data or methods used to predict potential impacts provided the best available information. Therefore, the analysis provided in the EIS is sufficient to support sound scientific judgments and informed decision making related to the proposed uses of the onshore and offshore portions of the environmental justice analysis area.

Finfish and Essential Fish Habitat

Monitoring studies of European and American offshore wind energy facilities to date (Hutchison et al. 2020; Raoux et al. 2017; Reubens et al. 2013, 2014) provide no indication of biologically significant adverse effects on finfish and their habitats. However, broader uncertainty remains about the long-term effects of changes in biological productivity resulting from the creation of new habitat types along the Atlantic OCS in the form of a distributed network of artificial reefs (Degraer et al. 2020). The nature and significance of potential ecological responses, such as changes in diet and predator-prey interactions resulting from changes in habitat productivity, are not fully known. Lastly, the nature, extent, and significance of potential spillover effects on broader ecosystem functions, such as seasonal stratification of the Cold Pool and larval dispersal patterns, are not fully understood (Johnson et al. 2021; van Berkel et al. 2020). Targeted modeling studies suggest that the effects of offshore wind development in the RI/MA and MA WEAs on water column stratification and larval dispersal patterns are unlikely to be ecologically significant (Johnson et al. 2021). However, this study considered only two out of several WEAs in the geographic analysis area, meaning that the potential effects resulting from full build-out of all WEAs within the geographic analysis area remain to be studied.

As stated, ongoing monitoring studies at European wind facilities and the Block Island Wind Farm in the United States provide a useful basis for evaluating the combined effects of these IPFs on the biological community as a whole, even if effects on individual species cannot be predicted with specificity. On balance, the current scientific information is sufficient to support sound scientific judgements and informed decision making because relevant studies monitoring changes at wind farms have not observed significant changes in finfish abundance and distribution at regional scales over years of study. For example, while wind farm installation can displace soft-bottomed habitat in favor of hard substrates, the affected areas usually represent a small fraction of available habitat. Moreover, offshore wind structures provide habitat complexity that generally results in an increase in biological productivity, which in turn can attract fish species that associate with complex habitat types (Degraer et al. 2020). Therefore, while some uncertainty remains, the available information does not suggest that long-term negative effects are likely. The similarity between the layouts analyzed for the different alternatives does not render any of this incomplete and unavailable information essential to a reasoned choice among alternatives.

There is uncertainty regarding the spatial and temporal occurrence of finfish and essential fish habitat (EFH) throughout the entire finfish and EFH geographic analysis area. This is especially true for Atlantic cod (*Gadus morhua*) use of the Coxes Ledge area, which is part of an ongoing study funded by BOEM examining the movements of commercial fish species in southern New England (National Oceanic and Atmospheric Administration [NOAA] 2020a). However, broadscale information is available from sources such as federal FMPs and from surveys completed to support COP submission. There is also uncertainty regarding behavioral effects from each IPF individually and cumulatively (e.g., operational noise effects on Atlantic cod communication during spawning). Again, BOEM is able to draw on existing scientific findings, as presented in Section 3.13 of the EIS and references therein, in the RWF EFH assessment (BOEM 2023b, 2023c), and in the National Marine Fisheries Service (NMFS) BA (BOEM 2023d, 2023e). The available information is suitable for characterizing the likely effects of each IPF and has been used to analyze potential impacts resulting from the Project and past, present, and reasonably foreseeable actions. For this reason, the analysis provided in the EIS is sufficient to support sound scientific judgments and informed decision making related to the proposed uses of the offshore portions of the geographic analysis area. Further, the similarity between the layouts analyzed for the different alternatives does not render any of this incomplete and unavailable information essential to a reasoned choice among alternatives. Therefore, BOEM concluded that the available information about potential impacts on finfish and EFH supports a reasoned choice among alternatives.

Land Use and Coastal Infrastructure

There is no incomplete or unavailable information related to the analysis of impacts on land use and coastal infrastructure.

Marine Mammals

Although there is some uncertainty regarding the temporal distribution of marine mammals and periods during which they might be especially vulnerable to Project disturbance, the NMFS BA (BOEM 2023d, 2023e) provides detailed species descriptions and life history information. NOAA has summarized the most current information about marine mammal population status, occurrence, and use of the region in their 2019 and 2020 stock status reports for the Atlantic OCS and Gulf of Mexico (Hayes et al. 2020, 2021). These studies provide a suitable basis for predicting the species, abundances, and distributions of marine mammals in the geographic analysis area.

Uncertainty also exists with regard to the effects of some IPFs on marine mammals. For example, there is still some uncertainty regarding the impacts on marine mammals from EMF produced by submarine cables. This uncertainty is due in part to difficulties in evaluating population-scale impacts around regional deployments (Taormina et al. 2018), to the large size and high mobility of marine mammals, and to other logistical constraints, which make experimental studies infeasible. As a result, no scientific studies have been conducted to examine the effects of altered EMF on marine mammals. Although scientific studies summarized by Normandeau Associates, Inc., et al. (2011) demonstrate that marine mammals are sensitive to and can detect small changes in magnetic fields, as described in Section 3.15 of the EIS, those potentially detectable impacts would only occur within a few feet of select cable segments. There is no basis to conclude that the potential detection of EMFs would lead to any measurable change in behavior. For this reason, the analysis provided in the EIS is sufficient to support sound scientific judgments and informed decision making related to the proposed uses of the offshore portions of the geographic analysis area.

Some uncertainty also exists regarding the cumulative acoustic impacts associated with pile-driving activities. The available information relative to impacts on marine mammals from pile driving associated with offshore wind development is primarily limited to information on harbor porpoise (*Phocoena phocoena*) and harbor seal (*Phoca vitulina*) because most of this research has occurred at European offshore wind projects, where large whales are uncommon. At this time, it is unclear if marine mammals would cease feeding and when individuals would resume normal feeding, migrating, breeding, etc., behaviors once daily pile-driving activities cease, or if secondary indirect impacts would persist. Certain species, notably North Atlantic right whale (*Eubalaena glacialis*), rely on specialized feeding strategies that appear to be sensitive to disruption (van der Hoop et al. 2019). These findings suggest that short-term behavioral disturbance could contribute to energy deficits that ultimately lead to reduced fitness (Fortune et al. 2013; van der Hoop et al. 2019). Under the cumulative impact scenario, individual whales may be exposed to acoustic impacts from multiple projects in 1 day or to acoustic impacts from one or more projects over multiple days. The consequences of these exposure scenarios have been analyzed with the best available information, but a lack of real-world observations on species' responses to pile-driving results is uncertain. Additionally, it is currently unclear how sequential years of construction of multiple projects would impact marine mammals. Future projects will undergo a project-specific analysis under NEPA, the Endangered Species Act, and the Marine Mammal Protection Act that may reach different impact conclusions from this analysis if warranted based on new scientific and potentially observable information, or if impacts are defined differently from the EIS.

There is also uncertainty about certain potential impacts on marine mammals resulting from the long-term presence of offshore wind structures in the environment. For example, operational WTGs would generate low-frequency underwater noise that may exceed the established minimum threshold for potential behavioral and auditory masking impacts within a short distance (e.g., approximately 120 feet) from each foundation, although detectable noise above ambient levels could extend up to 560 feet or more. These structures would contribute to and potentially increase ambient noise within each WEA, albeit at levels generally not associated with adverse effects on marine mammals. However, the 120 root mean square decibels (dB_{RMS}) threshold may not adequately represent the potential for adverse effects of chronic noise exposure (e.g., Cholewiak et al. 2018; Hatch et al. 2012; Jensen et al. 2009; Putland et al. 2017). The implications of long-term operational noise impacts and structure presence on marine mammal behavior, particularly the behavior of large whale species, are unclear. These potential impacts are topics of ongoing research.

There is broader uncertainty about how large whales will respond to the presence of extensive networks of novel offshore wind structures on the Atlantic OCS. Under the cumulative impact scenario, up to 3,110 new structures (i.e., WTGs and OSSs) could be constructed across the geographic analysis area. Although the planned spacing of structures would not obstruct whale movement between structures, the potential synergistic effects of structure presence and low-level operational noise are uncertain. There is also some uncertainty around reef effect and hydrodynamic impacts on prey and forage availability and predator-prey interactions. Additionally, these impacts could combine and interact with ongoing changes in marine species distribution and community composition driven by climate change. Displacement effects that result in increased interactions between vulnerable populations of marine mammals and commercial shipping and/or fishing activity could have significant long-term cumulative effects. The potential consequences of these impacts on the Atlantic OCS are unknown. Monitoring studies could be able to track these changes and observe how they may influence whale behavior. At present, BOEM has no basis to conclude that these IPFs would result in significant adverse impacts on any marine mammal species.

At present, currently available information suggests that hydrodynamic effects of foundation structures are likely to be localized and not additive when spaced at 1 nm in environments with strong seasonal stratification (van Berkel et al. 2020). Recent modeling of hydrodynamic effects suggests that surface currents could be affected by the presence of multiple wind farms potentially impacting the distribution of larvae (Johnson et al. 2021). There is insufficient information to determine if this conclusion is valid for broader scale development at the levels planned within the geographic analysis area.

BOEM determined that the overall costs of obtaining the missing information for or addressing uncertainty of the above topics for marine mammals are exorbitant or that the means to obtain it are not known. Therefore, BOEM extrapolated or drew assumptions from known information for similar species and/or situations, as presented in Section 3.15 of the EIS and in the BA submitted to NMFS (BOEM 2023d, 2023e). As a result, the information and methods used to predict potential impacts on marine mammals represent the best available information, and the analysis provided in the EIS is sufficient to support sound scientific judgments and informed decision making related to the proposed uses of the offshore portions of the geographic analysis area. Notwithstanding the foregoing, the similarity between the layouts analyzed for the different alternatives does not render any of this incomplete and unavailable information essential to a reasoned choice among alternatives. Therefore, BOEM has not identified incomplete or unavailable scientific information on marine mammal resources that is essential to a reasoned choice among alternatives.

Navigation and Vessel Traffic

The navigation and vessel traffic impact analysis in the EIS is based on automatic identification system (AIS) data for calendar year 2019. Vessel monitoring system (VMS) data for fishing vessels provided by the NMFS were the basis for polar histograms and other analytical outputs used in evaluating commercial and for-hire recreational fishing trips (see EIS Section 3.9). Some smaller recreational and fishing vessels carry an AIS; however, the AIS analysis likely excludes most vessels less than 65 feet (19.8 meters) long that traverse the WEA. In addition, as discussed under Commercial Fisheries and For-Hire Recreational Fishing, above, the VMS data provided by NMFS indicate the number of vessels in each fishery and their direction of travel while actively fishing, which speaks to alignment of the WTG grid. Nonetheless, the combination of AIS and VMS data described above represent the best available vessel traffic data and are sufficient to enable BOEM to make a reasoned choice among alternatives.

The U.S. Coast Guard's (USCG's) final report for the Areas Offshore of Massachusetts and Rhode Island Port Access Route Study (MARIPARS), evaluating the need for establishing vessel routing measures, was published in the *Federal Register* on May 27, 2020 (USCG 2020). The MARIPARS report recommends a standard and uniform grid pattern turbine layout throughout the Rhode Island and Massachusetts Lease Areas as the best way to facilitate predictable safe navigation throughout the contiguous leases. The five Rhode Island and Massachusetts offshore wind leaseholders, including Revolution Wind, have proposed a collaborative regional layout for wind turbines (1 × 1 nm apart in fixed east–west rows and north–south columns, with 0.7-nm theoretical transit lanes oriented northwest–southeast) across their respective BOEM leases (Geijerstam et al. 2019), which meets the layout rules set forth in the MARIPARS report recommendations. Although the USCG attached to the MARIPARS *Federal Register* docket the Responsible Offshore Development Alliance proposal (Hawkins 2020), which recommends additional transit corridors through the Lease Areas, the MARIPARS report concludes that if the layout in the recommendations was implemented, the USCG would likely not pursue additional formal or informal routing measures. As a cooperating agency with BOEM, the USCG would continue to consult over the course of the NEPA process for the Project as it relates to navigational safety and other aspects, including the impacts associated with alternatives assessed. Therefore, BOEM has not identified incomplete or unavailable information on navigation and vessel traffic that is essential to a reasoned choice among alternatives.

Other Marine Uses

In the context of this EIS, other marine uses include aviation and air traffic, land-based radar, marine mineral resources and dredged material disposal, military and national security, offshore energy (aside from the proposed Project), scientific research and surveys, and undersea cables. There is no incomplete or unavailable information related to the analysis of marine mineral resources and dredged material disposal, military and national security, aviation and air traffic, offshore energy (aside from the aspects described in this appendix for the proposed Project, and the reasonably foreseeable offshore wind projects for which BOEM has not received COPs), undersea cables, and land-based radar uses.

As discussed in Section 3.17 of the EIS for scientific research and surveys, analysis in the EIS discloses both Project-specific and cumulative impacts to NMFS's ability to continue conducting scientific research and surveys for the purpose of fisheries management and protected species management. Despite the foregoing, BOEM has concluded that the information provided by NOAA in Section 3.17 regarding scientific research and surveys is sufficient to support the impact findings presented in the EIS. Therefore, BOEM has not identified incomplete or unavailable information on scientific research and surveys that is essential to a reasoned choice among alternatives.

Recreation and Tourism

There is a lack of quantitative data related to recreational not-for-hire fishing in the recreation and tourism geographic analysis area; therefore, quantitative analysis for this resource is not possible at this time. BOEM is considering how best to approach this issue for future similar projects. *Fisheries Economics of the United States 2018* (NMFS 2021) is a comprehensive summary document and the data presented discuss the overall economic level for not-for-hire recreational anglers in the offshore New England region (Maine, New Hampshire, Rhode Island, Connecticut, and Massachusetts). However, the document does not relate to how projects such as the RWF are likely to affect not-for-hire recreational fishing and is not detailed enough in geographic extent to discuss specific recreational angling locations.

However, BOEM has determined that incomplete and unavailable resource information was either not relevant to a reasoned choice among alternatives or alternative data or methods used to predict potential impacts provided the best available information. Therefore, the analysis provided in the EIS 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.

Sea Turtles

Sea turtles are difficult to observe in the open ocean, and there is some uncertainty about the distribution of some turtle species (e.g., the green sea turtle [*Chelonia mydas*]) in relation to the Lease Area. The NMFS BA (BOEM 2023d, 2023e) provides a thorough overview of the available information about potential species occurrence and exposure to 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. For example, sea turtle sensitivity to potential EMF effects from the Project is not fully understood. Sea turtles are known to use the earth's magnetic field to orient in space and navigate between habitats (Irwin and Lohmann 2005; Courtillot et al. 1997). However, the available research has not examined how sea turtles respond to lower strength EMF levels on the order of those likely to result from the Project. Although there are no direct data on impacts on sea turtles from EMFs generated by underwater cables, the preponderance of evidence summarized in the BOEM-sponsored report by Normandeau et al. (2011) indicates that sea turtles are unlikely to detect most of the EMF impacts resulting from the Project. Potentially detectable EMF effects would be limited to within 5 feet of the short segments of cable laid on the seafloor that are not buried. Section 3.19 of the EIS and the NMFS BA (BOEM 2023d, 2023e) allowed BOEM's subject matter experts to estimate the potential risk to other species of sea turtles based on the assumption of similar anatomical, behavioral, and life history similarities, related to EMFs. Although the thresholds for EMF disturbance to the behavior of all potential species of sea turtles are not known, no adverse effects on sea turtles from the numerous submarine power cables around the world have been documented, and modeling of the anticipated EMFs generated by Project components suggests the majority of induced field strengths would likely be below detection levels. Similar to marine mammals, data are also not available to evaluate potential changes to normal movements of juvenile and adult sea turtles due to short-term elevated suspended sediments. Although some exposure may occur, total suspended sediment impacts would be limited in magnitude and duration and within the range of natural exposures periodically experienced by these species. On this basis, any resulting impact on behavior would likely be too small to be biologically meaningful, and no adverse impacts would be expected (NOAA 2020b).

There is also uncertainty relative to sea turtle responses to construction activities on the Atlantic OCS. Some potential for displacement from areas exposed to noise and disturbance exists. However, should displacement of individuals occur, 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 unclear whether concurrent construction of multiple projects, increasing the extent and intensity of impacts over a shorter duration or spreading out project construction, and associated 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. At this time, it is unclear if sea turtles that have ceased feeding during multiple construction activities would resume normal feeding, migrating, breeding, etc., behaviors once daily pile driving ceases or if secondary indirect impacts would continue. Under the cumulative impact scenario, individual sea turtles may be exposed to acoustic impacts from multiple projects in 1 day or to acoustic impacts from one or more projects over multiple days. The consequences of these exposure scenarios have been analyzed with the best available scientific information in EIS Section 3.19, although some level of uncertainty remains due to the lack of observational data on species responses to pile driving. In addition, modeled predictions of operational sound for large turbines (10 MW) indicate that sound levels could be greater than observed for existing wind turbines; actual sound levels are still predicted to be well below levels that could cause harm.

Some uncertainty exists in regard to the potential for sea turtle responses to Federal Aviation Administration hazard lights and navigation lighting associated with offshore wind development. Given the placement of the new structures far from nesting beaches and within the OCS, no impacts to nesting female or hatchling sea turtles would be expected. Revolution Wind has incorporated BOEM’s guidance (BOEM 2021; Orr et al. 2013) for avoiding and minimizing artificial lighting impacts on aquatic life into the Project design. This environmental protection measure would limit WTG and electrical service platform lighting to minimum levels required by regulation for worker safety, navigation, and aviation. Sea turtle sensitivity to these minimal light levels is unknown. However, given that 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 2023d, 2023e), this IPF is not expected to have any measurable impacts (adverse or beneficial) on sea turtles in the offshore environment.

More broadly, considerable uncertainty remains about how sea turtles would interact with long-term changes in biological productivity and community structure resulting from the development of an extensive network of artificial reefs 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. These IPFs are expected to interact with the ongoing influence of climate change on species distribution and behavior over broad spatial scales, but the nature and significance of these interactions are unclear. 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 described above for sea turtles and determined that the methods necessary to do so are lacking and/or the associated costs would be exorbitant. Where appropriate, BOEM inferred conclusions about the likelihood of potential biologically significant impacts from available information for similar species and/or situations. These methods are described in detail in EIS Section 3.19 EIS and in the NMFS BA (BOEM 2023d, 2023e). The approaches and methods used are based on the best available scientific information, and the analysis provided in the EIS is sufficient to support sound scientific judgements and informed decision making related to the proposed uses of the offshore portions of the analysis area. Notwithstanding the foregoing, the similarity between the layouts analyzed for the different alternatives does not render any of this incomplete and unavailable information essential to a reasoned choice among alternatives. Therefore, BOEM does not believe that there is incomplete or unavailable information on sea turtle resources that is essential to a reasoned choice among alternatives.

Visual Resources

There is no incomplete or unavailable information related to the analysis of impacts on visual resources.

Water Quality

There is no incomplete or unavailable information related to the analysis of impacts on water quality.

Wetlands and Non-tidal Waters

There is no incomplete or unavailable information related to the analysis of impacts on wetlands and non-tidal waters.

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APPENDIX D

Project Design Envelope and Maximum-Case Scenario

Contents

Figures

Tables

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Introduction

This environmental impact statement (EIS) assesses the impacts of the reasonable range of Revolution Wind Farm (RWF) and Revolution Wind Export Cable (RWEC) Project (the Project) designs that are described in the Revolution Wind construction and operations plan (COP) (VHB 2023) by using the maximum-case scenario process. The maximum-case scenario analyzes the aspects of each design parameter that would result in the greatest impact for each physical, biological, and socioeconomic resource. This EIS considers the interrelationship among aspects of the project design envelope (PDE) rather than simply viewing each design parameter independently. Additional information and guidance related to the PDE concept can be found in Chapter 1 of the EIS and on BOEM's website available at https://www.boem.gov/Draft-Design-Envelope-Guidance/. Table D-1 details the full range of maximum-case design parameters for the proposed Project and which parameters are relevant to the analysis for each EIS resource section (denoted with an *X*) in Chapter 3 of the EIS. Table D-2 and Figure D-1 detail the wind turbine generator (WTG) identification numbers and locations for the maximum-case scenario.

Table D-1. Maximum-Case Scenario List of Parameter Specifications

Design Parameter	Minimum Design Size	Maximum Design Size	3.4 Air Quality	3.5 Bats	3.6 Benthic Habitat and Invertebrates	3.7 Birds	3.8 Coastal Habitats and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel Traffic	3.17 Other Marine Uses	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Visual Resources	3.21 Water Quality	3.22 Wetlands and Non-tidal Waters
WIND FARM																					
Wind farm capacity	704 megawatt (MW)	880 MW	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WTG AND MONOPILE FOUNDATION																					
Turbine size	8 MW	12 MW	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Number of WTG positions	59	100	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Distance between positions	1 nautical mile (nm) between WTGs on an east–west, north–south grid	1 nm between WTGs along north–south rows, and 0.7 mile between WTGs within east–west rows	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Total tip height	647.6 feet (197.4 meters [m])	872.7 feet (266 m)		X		X		X	X						X	X	X		X		
Hub height	377 feet (115 m)	512 feet (156 m)		X		X		X	X						X	X	X		X		
Turbine height	646 feet (197 m)	873 feet (266 m)		X		X		X	X						X	X	X		X		
Rotor diameter	538 feet (164 m)	722 feet (220 m)		X		X		X	X						X	X	X		X		
Base height (foundation height–top of transition piece)	19.7 feet (6 m)	26 feet (8 m)		X		X		X	X						X	X	X		X		
Base (tower) width (at the top)	13 feet (4 m)	21 feet (6.4 m)		X		X		X	X						X	X	X		X		
Nacelle dimensions (length × width × height)	46 × 23 × 20 feet (14 × 7 × 6 m)	72 × 33 × 39 feet (22 × 10 × 12 m)		X		X		X	X						X	X	X		X		
Rotor swept zone area	5.2 acres (21,100 square meters [m^2])*	9.7 acres (39,400 m^2)*		X		X		X	X						X	X	X		X		

Design Parameter	Minimum Design Size	Maximum Design Size	3.4 Air Quality	3.5 Bats	3.6 Benthic Habitat and Invertebrates	3.7 Birds	3.8 Coastal Habitats and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel Traffic	3.17 Other Marine Uses	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Visual Resources	3.21 Water Quality	3.22 Wetlands and Non-tidal Waters
Blade length	259 feet (79 m)	351 feet (107 m)		X		X		X	X						X	X	X		X		
Blade width	16 feet (5 m)	26 feet (8 m)		X		X		X	X						X	X	X		X		
Base height (foundation height–top of transition piece)	82 feet (25 m)	128 feet (39 m)		X		X		X	X						X	X	X		X		
Air gap (mean sea level to bottom of blade tip)	93.5 feet (28.5 m)	151 feet (46 m)		X		X		X	X						X	X	X		X		
Foundation construction method	Pile driving	Pile driving	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Foundation and WTG vessel type	Jack-up vessel or derrick barge, vessel on dynamic positioning with feeder barges	Jack-up vessel or derrick barge, vessel on dynamic positioning with feeder barges	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Jack-up vessel seafloor penetration of spudcans (WTG and OSS)	52 feet	52 feet	X		X			X	X			X		X	X	X	X	X	X	X	
Jack-up radius around foundations (WTG and OSS)	656 feet	656 feet	X		X			X	X			X		X	X	X	X	X	X	X	
Jack-up seafloor preparation (WTG and OSS)	18.36 acres (assume all foundations need one jack up; 0.18 acre per jack up x 102 foundations = 18.36 acres)	21.14 acres (assume 15% of all foundations will need one additional jack up; 18.36 acres + 0.18*(0.15 x 102) = 21.14 acres)	X		X			X	X			X		X	X	X	X	X	X	X	
WTG coloring	RAL 9010 Pure White	RAL 7035 Light Grey				X			X						X	X	X		X		
Bureau of Ocean Energy Management (BOEM) aviation and navigation safety recommendations (BOEM 2021)	Two synchronized L-864 aviation medium-intensity red flashing obstruction lights mounted on the WTG nacelle at a height of approximately 530 feet (161.5 m); up to three L-810 low-intensity red flashing obstruction lights mounted on the WTG tower midsection at a height of approximately 312 feet (95 m); all lights would synchronize with 30 flashes per minute for air navigation lighting	Two synchronized L-864 aviation medium-intensity red flashing obstruction lights mounted on the WTG nacelle at a height of approximately 530 feet (161.5 m); up to three L-810 low-intensity red flashing obstruction lights mounted on the WTG tower midsection at a height of approximately 312 feet (95 m); all lights would synchronize with 30 flashes per minute for air navigation lighting		X		X		X	X						X	X	X		X		

Design Parameter	Minimum Design Size	Maximum Design Size	3.4 Air Quality	3.5 Bats	3.6 Benthic Habitat and Invertebrates	3.7 Birds	3.8 Coastal Habitats and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel Traffic	3.17 Other Marine Uses	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Visual Resources	3.21 Water Quality	3.22 Wetlands and Non-tidal Waters
BOEM aviation and navigation safety recommendations (BOEM 2021); U.S. Coast Guard (USCG) District 1 offshore structure marking guidance (USCG 2020a)	Two white flashing obstruction lights (color to be determined depending on structure classification) on each turbine approximately 20 to 23 meters above mean lower low water on opposite corners along the same horizontal plane, each visible from all approach directions to 3 nm	Two white flashing obstruction lights (color to be determined depending on structure classification) on each turbine approximately 20 to 23 meters above mean lower low water on opposite corners along the same horizontal plane, each visible from all approach directions to 3 nm		X		X		X	X						X	X	X		X		
BOEM aviation and navigation safety recommendations; USCG District 1 offshore structure Private Aids to Navigation (PATON) marking guidance (USCG 2020b)	Flashing white light visible to 1 nm for Class C structure (to be determined by USCG)	Flashing white light visible to 5 nm for Class A structure (to be determined by USCG)		X		X		X	X						X	X	X		X		
WTG foundation coloring	RAL 1023 Yellow from water line to height of at least approximately 50 feet	RAL 1023 Yellow from water line to height of at least approximately 50 feet		X		X		X	X						X	X	X		X		
Nautical hazard prevention device	Foghorns audible to 2 nm and emit 134 decibels at 3 feet (1 m) and a tone at a frequency of 660 hertz (Hz)	Foghorns audible to 2 nm and emit 134 decibels at 3 feet (1 m) and a tone at a frequency of 660 Hz		X	X	X		X				X		X	X	X	X				
Number of monopile foundations	61	102	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Monopile diameter	20–39 feet (tapered)	20–39 feet (tapered)	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Number of piles per foundation	1	1	X		X			X	X			X		X	X	X	X	X	X	X	
Seafloor disturbance—no scour protection—per monopile foundation	0.027 acre	0.027 acre	X		X			X	X			X		X	X	X	X	X	X	X	
Monopole and scour protection area per foundation	0.7 acre	0.7 acre	X		X			X	X			X		X	X	X	X	X	X	X	
Scour protection depth	2.2–4.6 feet above seafloor	2.2–4.6 feet above seafloor	X		X			X	X			X		X	X	X	X	X	X	X	
Seafloor preparation per foundation	31.1 acres	31.1 acres	X		X			X	X			X		X	X	X	X	X	X	X	
Vessel anchoring/mooring per foundation	Not provided	Not provided	X		X			X	X			X		X	X	X	X	X	X	X	
Hammer size for monopile foundation	4,000 kilojoules (kJ)	4,000 kJ	X		X			X	X			X		X	X	X	X	X	X	X	
Maximum penetration depth into seafloor	98 feet (monopile)	164 feet (monopile)	X		X			X	X			X		X	X	X	X	X	X	X	

Design Parameter	Minimum Design Size	Maximum Design Size	3.4 Air Quality	3.5 Bats	3.6 Benthic Habitat and Invertebrates	3.7 Birds	3.8 Coastal Habitats and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel Traffic	3.17 Other Marine Uses	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Visual Resources	3.21 Water Quality	3.22 Wetlands and Non-tidal Waters
Duration of pile driving (hours/pile)	1–4 hours	6–12 hours	X		X			X	X			X		X	X	X	X	X	X	X	
Duration of installation (per WTG)	36 hours	36 hours	X		X			X	X			X		X	X	X	X	X	X	X	
Duration of installation (foundations/day)	3	3	X		X			X	X			X		X	X	X	X	X	X	X	
Period of all WTG foundation pile driving	5 months	5 months	X		X			X	X			X		X	X	X	X	X	X	X	
OFFSHORE SUBSTATION (OSS)																					
Number of OSSs	1	2	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Period of installation and commissioning	8 months	8 months	X		X			X	X			X		X	X	X	X	X	X	X	
OSS height, excluding lightning protection	82 + 108 feet = 190 feet	190 feet		X		X		X	X						X	X	X		X		
OSS height, including lightning protection	82 + 180 feet = 262 feet	262 feet		X		X		X	X						X	X	X		X		
Topside length and width	321.5 × 216.5 feet	321.5 × 216.5 feet		X		X		X	X						X	X	X		X		
USCG lighting	See monopile turbine requirements	See monopile turbine requirements		X		X		X	X						X	X	X		X		
OSS number of piles per foundation	1	1	X		X			X	X			X		X	X	X	X	X	X	X	
Scour protection area (per monopile)	0.7 acre	0.7 acre	X		X			X	X			X		X	X	X	X	X	X	X	
Seafloor preparation per foundation	31.1 acres	31.1 acres	X		X			X	X			X		X	X	X	X	X	X	X	
OSS foundation construction method	Pile driving	Pile driving	X		X			X	X			X		X	X	X	X	X	X	X	
Diameter (minimum top to maximum bottom)	20–49 feet (tapered)	20–49 feet (tapered)	X		X			X	X			X		X	X	X	X	X	X	X	
Maximum hydraulic hammer energy	4,000 kJ	4,000 kJ	X		X			X	X			X		X	X	X	X	X	X	X	
INTER-ARRAY CABLE (IAC)																					
IAC capacity	72 kilovolts (kV)	72 kV	X		X			X	X			X		X	X	X	X	X		X	
IAC diameter	8 inches	8 inches																			
IAC length	155 miles	155 miles	X		X			X	X			X		X	X	X	X	X		X	

Design Parameter	Minimum Design Size	Maximum Design Size	3.4 Air Quality	3.5 Bats	3.6 Benthic Habitat and Invertebrates	3.7 Birds	3.8 Coastal Habitats and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel Traffic	3.17 Other Marine Uses	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Visual Resources	3.21 Water Quality	3.22 Wetlands and Non-tidal Waters
Maximum disturbance depth	10 feet	10 feet	X		X			X	X			X		X	X	X	X	X		X	
Target burial depth	4 feet	6 feet	X		X			X	X			X		X	X	X	X	X		X	
Disturbance corridor-cable only (width)	131 feet	131 feet	X		X			X	X			X		X	X	X	X	X		X	
Period of installation of the complete IAC system	5 months	5 months	X		X			X	X			X		X	X	X	X	X		X	
IAC installation rate	400 m/hour	400 m/hour	X		X			X	X			X		X	X	X	X	X		X	
IAC general disturbance corridor	2,471 acres	2,471 acres	X		X			X	X			X		X	X	X	X	X		X	
IAC seafloor disturbance due to boulder clearance (80% of total length)	1,976.8 acres	1,976.8 acres	X		X			X	X			X		X	X	X	X	X		X	
IAC secondary cable protection (10% of total length)	74.1 acres	74.1 acres	X		X			X	X			X		X	X	X	X	X		X	
OFFSHORE SUBSTATION-LINK CABLE (OSS-LINK CABLE)																					
OSS-link cable capacity	275 kV	275 kV	X		X			X	X			X		X	X	X	X	X		X	
OSS-link cable length	9 miles	9 miles	X		X			X	X			X		X	X	X	X	X		X	
Number of OSS-link cables	1	1	X		X			X	X			X		X	X	X	X	X		X	
Cable diameter	11.8 inches	11.8 inches	X		X			X	X			X		X	X	X	X	X		X	
Target burial depth	4 feet	6 feet	X		X			X	X			X		X	X	X	X	X		X	
Disturbance corridor (width)	131 feet	131 feet	X		X			X	X			X		X	X	X	X	X		X	
Maximum disturbance depth	10 feet	10 feet	X		X			X	X			X		X	X	X	X	X		X	
OSS-link cable installation rate	400 m/hour	400 m/hour	X		X			X	X			X		X	X	X	X	X		X	
OSS-link cable general disturbance corridor	148.0 acres	148.0 acres	X		X			X	X			X		X	X	X	X	X		X	
OSS-link cable seafloor disturbance due to boulder clearance (60% of total length)	89 acres	89 acres	X		X			X	X			X		X	X	X	X	X		X	

Design Parameter	Minimum Design Size	Maximum Design Size	3.4 Air Quality	3.5 Bats	3.6 Benthic Habitat and Invertebrates	3.7 Birds	3.8 Coastal Habitats and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel Traffic	3.17 Other Marine Uses	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Visual Resources	3.21 Water Quality	3.22 Wetlands and Non-tidal Waters
OSS-link cable protection (10% of total length)	4.4 acres	4.4 acres	X		X			X	X			X		X	X	X	X	X		X	
SUMMARY OF RWEC SEGMENT LENGTHS OFFSHORE																					
RWEC: OCS	Up to 19 miles (per cable)	N/A	X	X		X			X	X			X		X	X	X	X	X		X
RWEC: Rhode Island	23 miles (per cable)	N/A	X	X		X			X	X			X		X	X	X	X	X		X
Total RWEC segment lengths offshore	Approximately 42 miles (per cable)	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
RWEC OFFSHORE																					
RWEC capacity	275 kV	275 kV	X		X			X	X			X		X	X	X	X	X		X	
Number of RWECs	1	2	X		X			X	X			X		X	X	X	X	X		X	
RWEC diameter	11.8 inches	11.8 inches	X		X			X	X			X		X	X	X	X	X		X	
Disturbance corridor (width)	131 feet, up to 673 feet at joint locations	131 feet, up to 673 feet at joint locations	X		X			X	X			X		X	X	X	X	X		X	
Operational right-of-way (ROW)	1,640 feet	1,640 feet	X		X			X	X			X		X	X	X	X	X		X	
Target burial depth (offshore)	4 feet	6 feet	X		X			X	X			X		X	X	X	X	X		X	
RWEC installation rate	400 m/hour	400 m/hour	X		X			X	X			X		X	X	X	X	X		X	
Period of installation	8 months	8 months	X		X			X	X			X		X	X	X	X	X		X	
RWEC: trench width	up to 43 feet	up to 43 feet	X		X			X	X			X		X	X	X	X	X		X	
RWEC: Outer Continental Shelf (OCS) submarine cable general disturbance corridor	593.1 acres	593.1 acres	X		X			X	X			X		X	X	X	X	X		X	
RWEC: OCS boulder clearance (40% of route, included in general disturbance corridor amount)	237.2 acres	237.2 acres	X		X			X	X			X		X	X	X	X	X		X	
RWEC: OCS cable protection (10% of route for each cable)	17.8 acres	17.8 acres	X		X			X	X			X		X	X	X	X	X		X	

Design Parameter	Minimum Design Size	Maximum Design Size	3.4 Air Quality	3.5 Bats	3.6 Benthic Habitat and Invertebrates	3.7 Birds	3.8 Coastal Habitats and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel Traffic	3.17 Other Marine Uses	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Visual Resources	3.21 Water Quality	3.22 Wetlands and Non-tidal Waters
RWEC: OCS cable omega joints (two total)	20.4 acre	20.4 acre	X		X			X	X			X		X	X	X	X	X		X	
RWEC: Rhode Island (RI) submarine cable general disturbance corridor	731.4 acres	731.4 acres	X		X			X	X			X		X	X	X	X	X		X	
RWEC: RI boulder clearance (70% of route, included in general disturbance corridor amount)	512 acres	512 acres	X		X			X	X			X		X	X	X	X	X		X	
RWEC: RI cable protection (5% of route for each cable)	11.0 acres	11.0 acres	X		X			X	X			X		X	X	X	X	X		X	
RWEC: RI cable protection per crossing (7 existing submarine assets, all located within RI state waters)	21.9 acres	21.9 acres	X		X			X	X			X		X	X	X	X	X		X	
Vessel anchoring corridor	1,640 feet	1,640 feet	X		X			X	X			X		X	X	X	X	X		X	
RWEC AT LANDFALL																					
Landfall work area	3.1 acres	3.1 acres	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Transition joint bays (located within the landfall work area)	1,340 square feet	1,340 square feet	X				X		X				X				X			X	X
Temporary cofferdam exit pits (2X) for horizontal directional drilling (HDD) construction (located within landfall work area)	0.24 acre	0.94 acre	X				X		X				X				X			X	X
ONSHORE TRANSMISSION CABLE AND PROJECT COMPONENTS																					
Landfall sites	Multiple landfall sites are currently being evaluated within the approximate 20-acre landfall envelope, located at Quonset Point in North Kingstown, Rhode Island.		X	X	X		X	X		X	X	X		X				X		X	X
Landfall work area	3.1 acres within the landfall envelope, located at Quonset Point in North Kingstown, Rhode Island		X	X	X		X	X		X	X	X		X				X		X	X
Landfall transition method	HDD with possible cofferdam		X	X	X		X	X		X	X	X		X				X		X	X

Design Parameter	Minimum Design Size	Maximum Design Size	3.4 Air Quality	3.5 Bats	3.6 Benthic Habitat and Invertebrates	3.7 Birds	3.8 Coastal Habitats and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel Traffic	3.17 Other Marine Uses	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Visual Resources	3.21 Water Quality	3.22 Wetlands and Non-tidal Waters
Temporary anchor wall driven depth	20 feet		X	X	X		X	X		X	X	X		X				X		X	X
HDD cable duct diameter	3 feet		X	X	X		X	X		X	X	X		X				X		X	X
HDD cable duct length	0.6 mile		X	X	X		X	X		X	X	X		X				X		X	X
Landfall transition	Underground concrete transition vault		X	X	X		X	X		X	X	X		X				X		X	X
Onshore construction location	Single thermal concrete duct bank and splice vaults		X	X	X		X	X		X	X	X		X				X		X	X
Onshore construction method	Open trench (8-foot-wide trench within 25-foot-wide temporary disturbance corridor that expands to 30 × 75 feet at splice vaults) with HDD or other trenchless technology as needed		X	X	X		X	X		X	X	X		X				X		X	X
Onshore cable route	Landfall work area to The Narragansett Electric Company d/b/a National Grid (TNEC) Davisville Substation		X	X	X		X	X		X	X	X		X				X		X	X
Splice vaults	30 × 10 × 8 feet	30 × 70 × 16 feet	X	X	X		X	X		X	X	X		X				X		X	X
Onshore transmission cable corridor length	Approximately 1 mile		X	X	X		X	X		X	X	X		X				X		X	X
Onshore interconnection facility location	Immediately adjacent to the existing Davisville Substation in North Kingstown, Rhode Island		X	X	X		X	X		X	X	X		X				X		X	X
Length of underground ROW connecting the onshore substation (OnSS) to the interconnection facility	527 feet		X	X	X		X	X		X	X	X		X				X		X	X
Length of overhead ROW connecting the interconnection facility to the Davisville Substation	474 feet		X	X	X		X	X		X	X	X		X				X		X	X
Onshore interconnection facility limit of work size	Property size = 6 acres Limit of work = up to 4 acres Operational footprint = approximately 1.6 acres		X	X	X		X	X		X	X	X		X				X		X	X
OnSS (property size)	Property size = 15.7 acres Limit of work = up to 7 acres Operational footprint = approximately 4 acres		X	X	X		X	X		X	X	X		X				X		X	X

Design Parameter	Minimum Design Size	Maximum Design Size	3.4 Air Quality	3.5 Bats	3.6 Benthic Habitat and Invertebrates	3.7 Birds	3.8 Coastal Habitats and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel Traffic	3.17 Other Marine Uses	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Visual Resources	3.21 Water Quality	3.22 Wetlands and Non-tidal Waters
OPERATIONS AND MAINTENANCE (O&M) FACILITY																					
Port of Montauk	A new building with up to 1,000 square feet of office space and up to 6,000 square feet of equipment storage space would be constructed at the Port of Montauk.	A new building with up to 1,000 square feet) of office space and up to 6,000 square feet of equipment storage space would be constructed at the Port of Montauk.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Port of Davisville at Quonset Point	A new building with up to 1,000 square feet of office space and up to 11,000 square feet of equipment storage space would be constructed at the Port of Davisville at Quonset Point.	A new building with up to 1,000 square feet of office space and up to 11,000 square feet of equipment storage space would be constructed at the Port of Davisville at Quonset Point.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Port of Brooklyn	There are no plans to establish an O&M building at, or otherwise implement improvements to, the Port of Brooklyn, and use of this port is assumed to be limited to existing facilities maintained by the port.	There are no plans to establish an O&M building at, or otherwise implement improvements to, the Port of Brooklyn, and use of this port is assumed to be limited to existing facilities maintained by the port.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Port of Galilee	There are no plans to establish an O&M building at, or otherwise implement improvements to, the Port of Galilee, and use of this port is assumed to be limited to existing facilities maintained by the port.	There are no plans to establish an O&M building at, or otherwise implement improvements to, the Port of Galilee, and use of this port is assumed to be limited to existing facilities maintained by the port.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Port Jefferson	An existing upland building within an office park located approximately 6 miles from Port Jefferson. This building would serve as a regional O&M hub and headquarters for Orsted and multiple offshore wind projects. The building was recently purchased by Northeast Offshore, LLC, and has internal upgrades planned to establish office and warehouse space.	An existing upland building within an office park located approximately 6 miles from Port Jefferson. This building would serve as a regional O&M hub and headquarters for Orsted and multiple offshore wind projects. The building was recently purchased by Northeast Offshore, LLC, and has internal upgrades planned to establish office and warehouse space.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Notes: 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). Statute miles are more commonly used and are referred to simply as miles, whereas nautical miles are referred to by name or by their abbreviation “nm.” Numbers that were calculated are rounded to the closest whole number.

* This value was calculated based on information provided.

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Table D-2. Wind Turbine Generator Identification Numbers and Locations for the Maximum-Case Scenario as depicted in the Geophysical and Habitat Survey Viewer (Viewer) prepared by INSPIRE Environmental for the RWF and RWEC

COP Appendix H ID - Label not Identified in the Viewer	L045 ID - Identified as 'WTG and OSS Labels (L045)' Label in the Viewer	L085 ID - Identified as 'WTG and OSS Labels (L085)' Label in the Viewer	USCG - Label not Identified in the Viewer
WTG_01	1	–	AB08
WTG_02	2	B01	AC08
WTG_03	3	B02	AD07
WTG_04	4	B03	AD08
WTG_05	5	B04	AD09
WTG_06	6	B05	AD10
WTG_07	7	B06	AD11
WTG_08	8	B07	AE06
WTG_09	9	B08	AE07
WTG_10	10	B09	AE08
WTG_11	11	B10	AE09
WTG_12	12	B11	AE10
WTG_13	13	B12	AE11
WTG_14	14	B13	AF05
WTG_15	15	B14	AF06
WTG_16	16	–	AF07
OSS_2	OSS2	Z02	AF08
WTG_17	17	B15	AF09
WTG_18	18	B16	AF10

COP Appendix H ID - Label not Identified in the Viewer	L045 ID - Identified as 'WTG and OSS Labels (L045)' Label in the Viewer	L085 ID - Identified as 'WTG and OSS Labels (L085)' Label in the Viewer	USCG - Label not Identified in the Viewer
WTG_19	19	B17	AF11
WTG_20	20	B18	AG04
WTG_21	21	B19	AG05
WTG_22	22	B20	AG06
WTG_23	23	B21	AG07
WTG_24	24	B22	AG08
WTG_25	25	B23	AG09
WTG_26	26	B24	AH04
WTG_27	27	B25	AH05
WTG_28	28	B26	AH06
WTG_29	29	B27	AH07
WTG_30	30	B28	AH08
WTG_31	31	B29	AH09
WTG_32	32	B30	AJ02
WTG_33	33	B31	AJ03
WTG_34	34	B32	AJ04
WTG_35	35M	B33	AJ05
WTG_36	36	B34	AJ06
WTG_37	37	B35	AJ07
WTG_38	38	B36	AJ08

COP Appendix H ID - Label not Identified in the Viewer	L045 ID - Identified as 'WTG and OSS Labels (L045)' Label in the Viewer	L085 ID - Identified as 'WTG and OSS Labels (L085)' Label in the Viewer	USCG - Label not Identified in the Viewer
WTG_39	39	B37	AJ09
WTG_40	40	B38	AJ10
WTG_41	41	B39	AJ11
WTG_42	42	B40	AJ12
WTG_43	43	B41	AJ13
WTG_44	44	B42	AJ14
WTG_45	45M	B43	AJ15
WTG_46	46	–	AJ16
WTG_47	47	B44	AK08
WTG_48	48	B45	AK09
WTG_49	49	B46	AK10
WTG_50	50	–	AK11
WTG_51	51	B47	AK12
WTG_52	52	–	AK13
WTG_53	53M	B48	AK14
WTG_54	54	–	AK15
WTG_55	55	–	AK16
WTG_92	92	–	AL02
WTG_93	–	–	–
WTG_94	–	–	–

COP Appendix H ID - Label not Identified in the Viewer	L045 ID - Identified as 'WTG and OSS Labels (L045)' Label in the Viewer	L085 ID - Identified as 'WTG and OSS Labels (L085)' Label in the Viewer	USCG - Label not Identified in the Viewer
WTG_95	95	–	AL05
WTG_56	56M	B49	AL08
WTG_57	57	-	AL09
WTG_58	58M	B50	AL10
OSS_1	OSS1	Z01	AL11
WTG_59	59M	B51	AL12
WTG_60	60	–	AL13
WTG_61	61	–	AL14
WTG_62	62M	B52	AL15
WTG_63	63M	B53	AL16
WTG_64	64M	B54	AL17
WTG_65	65	B55	AL18
WTG_66	66	B56	AL19
WTG_67	67	B57	AL20
WTG_68	68M	B58	AL21
WTG_96	96	–	AM02
WTG_97	97	–	AM03
WTG_98	98	–	AM04
WTG_69	69	B59	AM11
WTG_70	70	B60	AM12

COP Appendix H ID - Label not Identified in the Viewer	L045 ID - Identified as 'WTG and OSS Labels (L045)' Label in the Viewer	L085 ID - Identified as 'WTG and OSS Labels (L085)' Label in the Viewer	USCG - Label not Identified in the Viewer
WTG_71	71	–	AM13
WTG_72	72M	B61	AM14
WTG_73	73	B62	AM15
WTG_74	74	–	AM16
WTG_75	75	B63	AM17
WTG_76	76	B64	AM18
WTG_77	77	B65	AM19
WTG_78	78	B66	AM20
WTG_79	79	B67	AM21
WTG_99	99	–	AN04
WTG_80	80	B68	AN11
WTG_81	81M	B69	AN12
WTG_82	82M	B70	AN13
WTG_83	83M	B71	AN14
WTG_84	84	B72	AN15
WTG_85	85	B73	AN16
WTG_100	100	–	AP04
WTG_86	86	B74	AP11
WTG_87	87	B75	AP12
WTG_88	88M	B76	AP13

COP Appendix H ID - Label not Identified in the Viewer	L045 ID - Identified as 'WTG and OSS Labels (L045)' Label in the Viewer	L085 ID - Identified as 'WTG and OSS Labels (L085)' Label in the Viewer	USCG - Label not Identified in the Viewer
WTG_89	89M	B77	AP14
WTG_90	90	B78	AP15
WTG_91	91	B79	AP16

Source: Revolution Wind (2023).

						- AB08													
						B01 AC08													
					B02 AD07	B03 AD08	B04 AD09	B05 AD10	B06 AD11										
				B07 AE06	B08 AE07	B09 AE08	B10 AE09	B11 AE10	B12 AE11										
			B13 AF05	B14 AF06	- AF07	Z02 AF08	B15 AF09	B16 AF10	B17 AF11										
		B18 AG04	B19 AG05	B20 AG06	B21 AG07	B22 AG08	B23 AG09												
		B24 AH04	B25 AH05	B26 AH06	B27 AH07	B28 AH08	B29 AH09												
B30 AJ02	B31 AJ03	B32 AJ04	B33 AJ05	B34 AJ06	B35 AJ07	B36 AJ08	B37 AJ09	B38 AJ10	B39 AJ11	B40 AJ12	B41 AJ13	B42 AJ14	B43 AJ15	- AJ16					
						B44 AK08	B45 AK09	B46 AK10	- AK11	B47 AK12	- AK13	B48 AK14	- AK15	- AK16					
- AL02	- AL03	- AL04	- AL05			B49 AL08	- AL09	B50 AL10	Z01 AL11	B51 AL12	- AL13	- AL14	B52 AL15	B53 AL16	B54 AL17	B55 AL18	B56 AL19	B57 AL20	B58 AL21
- AM02	- AM03	- AM04							B59 AM11	B60 AM12	- AM13	B61 AM14	B62 AM15	- AM16	B63 AM17	B64 AM18	B65 AM19	B66 AM20	B67 AM21
		- AN04							B68 AN11	B69 AN12	B70 AN13	B71 AN14	B72 AN15	B73 AN16					
		- AP04							B74 AP11	B75 AP12	B76 AP13	B77 AP14	B78 AP15	B79 AP16					

WTG
Dismissed WTG

Figure D-1. Wind turbine generator identification numbers and locations for the maximum-case scenario (Revolution Wind 2023).

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APPENDIX E

Planned Activities Scenario and
Reasonably Foreseeable Future Activities and Projects

Contents

Tables

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Planned Activities Scenario

The impacts resulting from the planned activities scenario are the incremental effects of the Proposed Action on the environment added to other reasonably foreseeable planned actions in the area (40 Code of Federal Regulations [CFR] 1502.15). This appendix discusses resource-specific planned activities that could occur if Project impacts occur in the same location and time frame as impacts from other reasonably foreseeable planned actions. The *Project* here is the construction, operations and maintenance (O&M), and decommissioning of a wind energy project located within the Bureau of Ocean Energy Management's (BOEM's) Renewable Energy Lease Area OCS-A 0486, approximately 15 nautical miles (18 statute miles) southeast of Point Judith, Rhode Island and approximately 13 nautical miles (15 statute miles) east of Block Island, Rhode Island.

BOEM anticipates that impacts could occur between the start of Project construction in 2023 and the completion of Project decommissioning, which would occur within 2 years of the end of the lease (up to 35 years postconstruction). The geographic analysis area (GAA) is defined by the impact-producing factor (IPF) with the maximum geographic area of impact, for example sound during pile driving. For the mobile resources, bats, birds, finfish and invertebrates, marine mammals, and sea turtles, the species potentially impacted are those that occur within the area of impact of the Proposed Action. The GAA for these mobile resources is the general range of the species. The purpose of these analysis areas is to capture the impacts from planned activities to each of those resources potentially impacted by the Proposed Action. The GAA for each resource area is defined in the resource area sections of the environmental impact statement (EIS).

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

Reasonably Foreseeable Future Activities and Projects

This section includes a list and description of other reasonably foreseeable activities that could contribute to cumulative impacts within the defined GAA for each resource category. Projects or actions that are considered speculative per the definition provided in 43 CFR 46.30[1] are noted in subsequent tables but excluded from the planned activities impact analysis in Chapter 3.

Planned (cumulative) activities described in this section consist of 10 types of actions: 1) other offshore wind energy development activities; 2) undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); 3) tidal energy projects; 4) marine minerals use and ocean-dredged material disposal; 5) military use; 6) marine transportation; 7) fisheries use and management; 8) global climate change; 9) oil and gas activities; and 10) onshore development activities.

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

BOEM analyzed the possible extent of future other offshore wind energy development activities on the Atlantic Outer Continental Shelf (OCS) to determine reasonably foreseeable cumulative effects measured by installed power capacity. Table E-1 represents the status of projects as of March 17, 2023. The methodology for developing the scenario is largely the same as for the Vineyard Wind project (BOEM 2021a) and is outlined in the footnotes in Table E3-1.

Monitoring and Mitigation

Future offshore wind projects could require monitoring or mitigation as part of BOEM approvals under the National Environmental Policy Act (NEPA) and OCSLA. Although specific measures are too speculative to include at this time, BOEM anticipates that measures could include actions such as passive acoustic monitoring, trawl surveys, acoustic telemetry, and gillnet or ventless trap surveys.

Table E-1. Offshore Wind Activities on the U.S. Atlantic Coast (dates shown as of March 17, 2023)

Lease Number	States	Lessee/Developer Name	Project Name	Construction Date	Operations Date	Facility Description	BOEM Permitting Stage*	Power Purchase Agreement/ Offshore Renewable Energy Certificate Status
Active Projects (state)								
N/A (state project)	Maine	New England Aqua Ventus, LLC	NE Aquaventus	2024	2024	11 MW (1 WTG)	N/A	PPA with ME
N/A (state project)	Rhode Island	Deepwater Wind, LLC (now Orsted)	Block Island Wind Farm	2015	2016	30 MW (5 WTGs)	N/A	PPA with RI
Active Projects (federal)								
OCS-A 0483	Virginia	Virginia Electric and Power Company (dba Dominion Virginia Power)	Coastal Virginia Offshore Wind	2023	2023	2,500 to 3,000 MW (205 WTGs); one met buoy	SAP approved; New SAP submitted and approved; COP submitted	No PPAs signed to date
OCS-A 0486	Rhode Island and Connecticut	Revolution Wind, LLC	Revolution Wind (Proposed Action)	2024	2024	Up to 880 MW (100 WTGs; two OSSs)	COP submitted; SAP approved	2 PPAs with CT and one PPA with RI
OCS-A 0487	New York	Sunrise Wind LLC	Sunrise Wind	2024	2024	Up to 934 MW (94WTGs)	COP submitted	OREC awarded by NYSERDA (PPA with NY)
OCS-A 0490 (portion)	Maryland	U.S. Wind Inc.	U.S. Wind	2024	2024	Up to 2,000 MW (121 WTGs)	COP submitted; SAP approved	OREC awarded by State of Maryland
OCS-A 0497	Virginia	Virginia Department of Mines, Minerals and Energy (	Coastal Virginia Offshore Wind	2021	2021	12 MW (two WTGs-6 MW each); one wave/current buoy	Operating	N/A (research)
OCS-A 0498 (portion)	New Jersey	Ocean Wind, LLC	Ocean Wind 1	2024	2025	1,100 MW (98 WTGs)	COP submitted SAP approved	OREC awarded by NJ
OCS-A 0499	New Jersey	Atlantic Shores Offshore Wind, LLC	Atlantic Shores	2025	2025	Up to 1,510 MW (105 to 136 WTGs)	SAP approved; COP submitted	OREC signed with NJ for 1,510 MW.
OCS-A 0500 (portion)	Massachusetts	Bay State Wind LLC	Bay State Wind	2026	2027	800 MW; two FLIDAR buoys; one met buoy	COP in progress SAP approved	No PPA signed to date
OCS-A 0501 (north)	Massachusetts	Vineyard Wind LLC	Vineyard Wind 1	2023	2023	800 MW (62 WTGs); two met buoys	ROD issued	PPA with MA
OCS-A 0534 and portion of OCS-A 0501	Massachusetts	New England Wind, LLC	Park City Wind (Phase 1) Commonwealth Wind (Phase 2)	2024	2026	Up to a combined 2,284 MW (130 WTGs or ESP) positions) for both phases	COP in progress	PPA with CT (Phase 1) No PPA signed to date (Phase 2)
OCS-A 0508	North Carolina, Virginia	Kitty Hawk Wind, LLC	Kitty Hawk North Wind	2027	2027	Up to 1,242 MW (69 WTGs; up to two buoys; and up to two platforms	COP submitted; SAP approved	No PPA signed to date

Lease Number	States	Lessee/Developer Name	Project Name	Construction Date	Operations Date	Facility Description	BOEM Permitting Stage*	Power Purchase Agreement/ Offshore Renewable Energy Certificate Status
OCS-A 0508 (remainder)	Virginia/North Carolina	Kitty Hawk Wind, LLC	Kitty Hawk Wind, South	2027	2028	Up to 2,178 MW (121 WTGs)	SAP approved; COP in progress	No PPAs signed to date
OCS-A 0512)	New York	Empire Offshore Wind LLC	Empire Wind 1, Empire Wind 2	2024	2027	Up to 2,176 MW (147 WTGs); two met buoys; one wave/met buoy; one subsea current meter mooring	COP submitted; SAP approved	PPA with NY
OCS-A 0517	New York	South Fork Wind, LLC	South Fork Wind Farm	2023	2023	130 MW (up to 12 WTGs); one met buoy	ROD issued COP approved	PPA with NY
OCS-A 0519 (portion)	Delaware, Maryland	Skipjack Offshore Energy, LLC	Skipjack	2024	2024	192 MW (up to 16 WTGs); one met buoy	COP in progress	OREC awarded by State of Maryland (connection to PJM grid in DE)
OCS-A 0521	Massachusetts	Mayflower Wind Energy, LLC	South Coast Wind	2024	2024	Up to 1,600–2,400 MW (147 WTGs); one met buoy	SAP approved; COP submitted	PPA with MA (up to 804 MW) Applying for other PPAs
OCS-A 0520	Massachusetts	Beacon Wind, LLC	Beacon Wind (Phase 1) Beacon Wind (Phase 2)	2024–2027	2026–2029	Up to 2,330 MW (188 WTGs)	SAP submitted; COP in progress	No PPA signed to date
Future Projects (federal)								
OCS-A 0482	Delaware	GSOE I LLC (Orsted and PSEG)	Garden State Offshore Energy	By 2030, spread over 2023–2030			SAP approved	PPA with DE and NJ
OCS-A 0487 (remainder)	Rhode Island	Sunrise Wind, LLC	TBD	By 2030, spread over 2025–2030			SAP approved	No PPAs signed to date
OCS-A 0500 (remainder)	Massachusetts	Bay State Wind LLC	TBD	By 2030, spread over 2025–2030			SAP approved	No PPAs signed to date
OCS-A 0519 (remainder)	Maryland/Delaware	Skipjack Offshore Energy, LLC	To be determined (TBD)	By 2030, spread over 2023–2030			SAP approved	No PPAs signed to date
OCS-A 0522	Massachusetts	Vineyard Wind LLC	Liberty Wind	By 2030, spread over 2025–2030			SAP submitted	No PPAs signed to date
OCS-A 0532 (portion)	New Jersey	(Orsted North America)	Ocean Wind 2	By 2030, spread over 2026–2030			SAP approved	OREC awarded by NJ for 1,148 MW

Lease Number	States	Lessee/Developer Name	Project Name	Construction Date	Operations Date	Facility Description	BOEM Permitting Stage*	Power Purchase Agreement/ Offshore Renewable Energy Certificate Status
OCS-A 0537	New York/New Jersey	Bluepoint Wind, LLC	Central Bight	By 2030, spread over 2026–2030			Lease issuance	No PPAs signed to date
OCS-A 0538	New York/New Jersey	Attentive Energy LLC	Hudson South B				Lease issuance	No PPAs signed to date
OCS-A 0539	New York/New Jersey	Community Offshore Wind, LLC	Hudson South C				Lease issuance	No PPAs signed to date
OCS-A 0541	New York/New Jersey	Atlantic Shores Offshore Wind Bight, LLC	Hudson South E				Lease issuance	No PPAs signed to date
OCS-A 0542	New York/New Jersey	Invenergy Wind Offshore LLC	Hudson South F				Lease issuance	No PPAs signed to date
OCS-A 0544	New York/New Jersey	Vineyard Mid-Atlantic LLC	Hudson North				Lease issuance	No PPAs signed to date
OCS-A 0545	North Carolina/South Carolina	TotalEnergies Renewables	TotalEnergies Renewables Wind				Lease issuance	No PPAs signed to date
OCS-A 0546	North Carolina/South Carolina	Duke Energy Renewables	Duke Energy Renewables Wind				Lease issuance	No PPAs signed to date
OCS-A 0549	New York/New Jersey	Atlantic Shores Offshore Wind, LLC	Atlantic Shores North				Lease issuance	No PPAs signed to date

Notes: – = no data; COP = construction and operations plan; CT = Connecticut; DE = Delaware; MA = Massachusetts; MD = Maryland; ME = Maine; MW = megawatts; NA = not applicable; NJ = New Jersey; NY = New York; NYSERDA = New York State Energy Research and Development Authority; OREC = offshore renewable energy certificate; PPA = power purchase agreement; RI = Rhode Island; ROD = record of decision; SAP = site assessment plan; TBD = to be determined; WTGs = wind turbine generators.

* Under BOEM Permitting Stage, COP status is assumed to be in process, under review, or not yet commenced based on publicly available information.

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Offshore Wind Energy Development Activities

Site Characterization Studies

A lessee is required to provide the results of site characterization activities with its site assessment plan (SAP) or COP. For the purposes of the planned activities effects analysis, BOEM makes the following assumptions for survey and sampling activities (BOEM 2016):

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

Table E-2 summarizes the typical site characterization surveys, the types of equipment and/or method used, and which resources the survey information would inform (BOEM 2013, 2016).

Table E-2. **Typical Site Characterization Survey Information**

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

Source: BOEM (2016).

Site Assessment Activities

After SAP approval, a lessee can evaluate the meteorological conditions, such as wind resources, with the approved installation of meteorological towers and/or buoys. Site assessment activities have been approved or are in the process of being approved for multiple lease areas consisting of one to three meteorological buoys per SAP (see Table E-1). 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. This planned activities analysis considers these site assessment activities.

Construction and Operation of Offshore Wind Facilities

Table E-1 lists all offshore wind leasing activities that BOEM considers reasonably foreseeable by lease areas and projects, their permitting stage/assessment, and anticipated timeline.

Commercial Fisheries Cumulative Fishery Effects Analysis

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

Table E-3. Offshore Wind Project Construction Schedule (dates shown as of March 27, 2023)

<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>Aquaventis (state waters)</td><td>–</td><td>–</td><td>–</td><td>–</td><td>2</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>Block Island (state waters)</td><td>5</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td colspan="12">Massachusetts/Rhode Island Region</td></tr>
<tr><td>Vineyard Wind 1 part of OCS-A 0501</td><td>–</td><td>–</td><td>–</td><td>63</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>South Fork, OCS-A 0517</td><td>–</td><td>–</td><td>–</td><td>13</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>Sunrise, OCS-A 0487</td><td>–</td><td>–</td><td>–</td><td>–</td><td>95</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])</td><td>–</td><td>–</td><td>–</td><td>–</td><td>64</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>66</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>South Coast Wind, OCS-A 0521</td><td>–</td><td>–</td><td>–</td><td>–</td><td>149</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>Beacon Wind, part of OCS-A 0520 (Phase 1)</td><td>–</td><td>–</td><td>–</td><td>–</td><td colspan="3">95</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>Beacon Wind, part of OCS-A 0520 (Phase 2)</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td colspan="3">95</td><td>–</td></tr>
<tr><td>Bay State Wind, part of OCS-A 0500</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td colspan="6" rowspan="4">75</td></tr>
<tr><td>Vineyard Northeast Wind (OCS-A 0522)</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>OCS-A 0500 remainder</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>OCS-A 0487 remainder</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>Estimated annual Massachusetts/Rhode Island construction</td><td>0</td><td>0</td><td>0</td><td>76</td><td>403</td><td>441</td><td>0</td><td>95</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>76</td><td>479</td><td>920</td><td>1,015</td><td>1,015</td><td>1,015</td><td>1,015</td></tr>
</table>

<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 colspan="12">New York/New Jersey Region</td></tr>
<tr><td>Ocean Wind 1, OCS-A 0498</td><td>–</td><td>–</td><td>–</td><td>–</td><td colspan="2">101</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>Atlantic Shores South, OCS-A 0499</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>-</td></tr>
<tr><td>Ocean Wind 2, part of 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">57</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>–</td><td colspan="4">90</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>OW Ocean Winds East LLC, OCS-A 0537</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td colspan="5">82</td></tr>
<tr><td>Attentive Energy LLC, OCS-A 0538</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td colspan="5">102</td></tr>
<tr><td>Bight Wind Holdings, LLC, OCS-A 0539</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td colspan="5">148</td></tr>
<tr><td>Atlantic Shores Offshore Wind Bight, OCS-A 0541</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td colspan="5">95</td></tr>
<tr><td>Invenergy Wind Offshore LLC, OCS-A 0542</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td colspan="5">99</td></tr>
<tr><td>Vineyard Mid-Atlantic LLC, OCS-A 0544</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td colspan="5">104</td></tr>
<tr><td>Atlantic Shores North, OCS-A 0549</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>165</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>Estimated annual New York/New Jersey construction</td><td>0</td><td>0</td><td>0</td><td>57</td><td>191</td><td>141</td><td>906</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>57</td><td>248</td><td>389</td><td>1,295</td><td>1,295</td><td>1,295</td><td>1,295</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, OCS-A 0490</td><td>–</td><td>–</td><td>–</td><td>–</td><td>125</td><td>–</td><td>–</td><td>–</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 annual 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>
</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	96	238	238	238	238	238	238
Virginia/North Carolina Region											
CVOW, OCS-A 0497	2	–	–	–	–	–	–	–	–	–	–
CVOW-C, OCS-A 0483	–	–	–	208	–	–	–	–	–	–	–
Kitty Hawk, OCS-A 0508	–	–	–	–	–	–	–	70	–	–	–
Kitty Hawk Wind South, OCS-A 0508 remainder	–	–	–	–	–	–	–	123		–	–
TotalEnergies Renewables Wind, LLC OCS-A 0545	–	–	–	–	–	–	–	–	–	65	
Duke Energy Renewables Wind, LLC OCS-A 0546	–	–	–	–	–	–	–	–	–	65	
Estimated annual Virginia/North Carolina construction:	2	0	0	208	0	0	0	193	0	130	0
Estimated O&M total	2	2	2	2	210	210	210	210	403	533	533
Total											
Estimated annual total construction	7	0	0	815	722	565	1,050	0	0	0	0
Estimated O&M total	7	7	7	7	822	1,544	2,109	3,159	3,159	3,159	3,159

Note: CVOW = Coastal Virginia Offshore Wind.

Incorporation by Reference of Cumulative Impacts Study

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

The BOEM (2019) study identifies the relationships between IPFs associated with specific past, present, and reasonably foreseeable actions and activities in the North Atlantic OCS, which were incorporated into this EIS analysis. If an IPF was not associated with the RWF Project, it was not included in the impacts analysis of planned activities.

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

Undersea Transmission Lines, Gas Pipelines, and Other Submarine Cables

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

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

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

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

Tidal Energy Projects

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

- The Bourne Tidal Test Site, located in the Cape Cod Canal near Bourne, Massachusetts, is a testing platform for tidal turbines that was installed in late 2017 by the Marine Renewable Energy Collaborative. The Bourne Tidal Test Site offers a test platform for tidal turbines (MRECo 2017, 2018).
- Cobscook Bay Tidal Project, located in Maine, is a Federal Energy Regulatory Commission-(FERC) licensed tidal project that began operations in 2012. The project owner, Ocean Power Energy Company, has informed FERC that it will not apply for relicensing, and removal and site restoration activities are anticipated to be conducted prior to its current license expiration date in January 2022 (FERC 2012a).
- Western Passage Tidal Energy Project, a proposed tidal energy site in the Western Passage, received a preliminary permit from FERC in 2016. The preliminary permit allows developers to study a project but does not authorize construction.
- The Roosevelt Island Tidal Energy (RITE) Project located in the East Channel of the East River, a tidal strait connecting the Long Island Sound with the Atlantic Ocean in the New York Harbor. In 2005, Verdant Power petitioned FERC for permission to the first U.S. commercial license for tidal power. In 2012, FERC issued a 10-year license to install up to 1 MW of power (30 turbines/10 TriFrames) at the RITE project (FERC 2012b; Verdant Power 2018).

Dredging and Port Improvement Projects

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

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

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

- The Port of New Bedford was awarded a $15.4 million U.S. Department of Transportation Better Utilizing Investments to Leverage Development grant to improve the port's infrastructure and to help with the removal of contaminated materials. The funding will be used to extend the port's bulkhead, creating room for 60 additional commercial vessels, and additional sites for offshore wind staging (Phillips 2018).
- The Port of New Bedford is currently developing the Foss Marine Terminal, which will provide an additional full-service base of operations and terminal logistics facility to support offshore wind projects off Massachusetts and the northeastern seaboard (New Bedford Port Authority 2022). The New Bedford Foss Marine Terminal will provide storage and laydown yards for equipment and materials, berth facilities for tug and barge operations, and will host crew transfer vessel and service operation vessel support services. The redevelopment will also create new office space for project teams and a marine coordination center for technicians involved in offshore wind projects. Construction of the terminal facility is anticipated to be completed in the spring 2023.
- Proposed New Haven Harbor Improvements would include deepening the main ship channel, maneuvering area, and turning basin to -40 feet MLLW and widening the main channel and turning basin to allow larger vessels to efficiently access the Port of New Haven’s terminals. The proposed improvements would remove approximately 4.28 million cubic yards of predominately glacially deposited silts from the federal channel (USACE 2018c).
- The Nature Conservancy seeks a permit to place an artificial reef array in Narraganset Bay at 130 Shore Road in Narragansett Bay in East Providence, Rhode Island. The proposed work involves the construction of a 0.14-acre artificial reef using 91 pre-fabricated reef modules. The artificial reef array would consist of 58 Pallet Balls (4.0 × 2.9 feet) and 33 Bay Balls (3 × 2 feet). The reef modules would be transported to the project site by barge and lowered to the seafloor by crane (USACE 2019).
- The RI CRMC has awarded funding for five habitat restoration projects in the 19th year of its Rhode Island Coastal and Estuarine Habitat Restoration Trust Fund (RI CRMC 2022). These projects comprise a dam removal assessment, streambank stabilization on the Woonasquatucket River, salt marsh restoration, habitat restoration and invasive species management, and fish passage improvement on the Saugatucket River (RI CRMC 2018a).
- The Town of Dennis seeks a permit for the selective dredging of multiple navigation and mooring basins within multiple waterways in the towns of Dennis and Yarmouth. Suitable dredged material will be used as nourishment on multiple town-owned beaches in Dennis whereas material that is not deemed suitable for beach nourishment will be disposed of at the Cape Cod Bay Disposal Site and at the South Dennis Landfill. The town is requesting to dredge approximately 434,310 cubic yards from portions of these waterways over 10 years encompassing an area of approximately 96.03 acres (USACE 2018d).

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

- The Connecticut Port Authority (CPA) announced a $93 million public-private partnership to upgrade the Connecticut State Pier in New London to support the offshore wind industry (Sheridan 2019). According to the Connecticut Maritime Strategy 2018 (CPA 2018a), New London is the only major port between New York and Maine that does not have vertical obstruction and offshore barriers, two factors that are critical for offshore wind turbine assembly. The document includes strategic objectives to manage and redevelop the Connecticut State Pier partially to support the offshore wind industry, which could create a dramatic increase in demand for the Connecticut State Pier and regional job growth. The development partnership, announced in May 2019, includes a 3-year plan to upgrade infrastructure to meet heavy-lift requirements of Orsted and Eversource offshore wind components (Cooper 2019). Redevelopment of the Connecticut State Pier is considered a reasonably foreseeable activity.
- In Rhode Island, Revolution Wind, LLC has committed to investing approximately $40 million in improvements at the Port of Providence, the Port of Davisville at Quonset Point, and possibly other Rhode Island ports for the Revolution Wind Project (Kuffner 2018). This investment will position Rhode Island ports to participate in construction and operation of future offshore wind projects in the region (Rhode Island Governor's Office 2018). The Port of Davisville has added a 150-megaton mobile harbor crane, which will enable the port to handle wind turbines and heavy equipment, and enables the Port of Davisville to participate in regional offshore wind projects (Port of Davisville 2017). Further improvements at Rhode Island ports to support the offshore wind industry are considered reasonably foreseeable.
- The Massachusetts Clean Energy Center (MassCEC) has identified 18 waterfront sites in Massachusetts that may be available and suitable for use by the offshore wind industry. Potential activities at these sites include manufacturing of offshore wind transmission cables, manufacture and assembly of turbine components, substation manufacturing and assembly, O&M bases, and storage of turbine components (MassCEC 2017a, 2017b, 2017c).
- The MassCEC manages the New Bedford Marine Commerce Terminal in New Bedford, Massachusetts. The 29-acre facility was completed in 2015 and is the first in North America designed specifically to support the construction, assembly, and deployment of offshore wind projects (MassCEC 2018). The New Bedford Port Authority Strategic Plan 2018–2023 contains goals related to expanding the New Bedford Marine Commerce Terminal to improve and expand services to the offshore wind industry, including development of North Terminal with the capacity to handle two separate offshore wind installation projects in the future (Port of New Bedford 2018). Vineyard Wind signed an 18-month lease with the Marine Commerce Terminal in October 2018 (Port of New Bedford 2020) and has supported the New Bedford Port Authority with grants to develop publicly owned facilities to support shore-based operations for offshore wind facilities (Vineyard Wind 2019).

Marine Minerals Use and Ocean Dredged Material Disposal

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

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

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

Military Use

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

Marine Transportation

Marine transportation in the region is diverse and sourced from many ports and private harbors from New York to Massachusetts. Commercial vessel traffic in the region includes research, tug/barge, liquid tankers (such as those used for liquid petroleum), cargo, military and search-and-rescue vessels, and commercial fishing vessels. Recreational vessel traffic includes cruise ships, sailboats, and charter boats. A number of federal agencies, state agencies, educational institutions, and environmental non-governmental organizations participate in ongoing research offshore including oceanographic, biological, geophysical, and archaeological surveys.

One new regional maritime highway project that has received funding from the U.S. Department of Transportation (USDOT) Maritime Administration (MARAD) is a new barge service (Davisville/Brooklyn/ Newark Container-on-Barge Service). This service is proposed to run twice each week in state waters between Newark, New Jersey; Brooklyn, New York; and the Port of Davisville in Rhode Island (USDOT MARAD 2021), which is located on Quonset Point, one of the potential O&M locations. The project received grant funding from MARAD in August 2018 (fiscal year 2017) to purchase material for handling equipment for the biweekly barge service (USDOT MARAD 2022).

National Marine Fisheries Service Activities

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

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

Directed Take Permits for Scientific Research and Enhancement

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

Fisheries Use and Management

NMFS implements regulations to manage commercial and recreational fisheries in federal waters, including those within which the Project would be located; the State of New York, state of Rhode Island, and Commonwealth of Massachusetts regulate commercial fisheries in state waters (within 3 nautical miles of the coastline). There are several aquaculture sites in Narragansett Bay; however, the Lease Area and the RWEC centerline does not intersect any of these sites (Suffolk County 2018). The closest aquaculture site to the RWEC centerline is located on the western shoreline of Conanicut Island, approximately 1,427 feet (435 m) from the RWEC route centerline (VHB 2023).

The project overlaps two of NMFS' eight regional councils to manage federal fisheries: Mid-Atlantic Fishery Management Council (MAFMC), which includes New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia and North Carolina; and New England Fishery Management Council (NEFMC), which includes Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut (NEFMC 2016). The councils manage species with many fishery management plans that are frequently updated, revised, and amended and coordinate with each other to jointly manage species across jurisdictional boundaries (MAFMC 2019). Many of the fisheries managed by the councils are fished for in state waters or outside of the Mid-Atlantic region, so the council works with the Atlantic States Marine Fisheries Commission (ASMFC). ASMFC is composed of the 15 Atlantic coast states and coordinates the management of marine and anadromous resources found in the states' marine waters. In addition, the lobster and Jonah crab fisheries are cooperatively managed by the states and NMFS under the framework of the ASMFC (2019).

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

NOAA Fisheries also manages highly migratory species (HMS), such as tuna and sharks, that can travel long distances and cross domestic boundaries.

Global Climate Change

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

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

States and regions look to offshore wind as a key component in their strategic plans to meet emissions goals in part because offshore wind can provide a low-carbon/no-carbon electricity supply source for current and increasing needs of electrified heating and transportation. Offshore wind projects produce less net greenhouse gas (GHG) emissions over the life of the projects when compared to other energy sources currently in use. Table E-4 summarizes regional plans and policies that are in place to address climate change, and Table E-5 summarizes resiliency plans.

Table E-4. Climate Change Plans and Policies

Plans and Policies	Summary/Goal
Connecticut	
2008 Global Warming Solutions Act	Sets forth statutory requirements to reduce GHG emissions 10% below 1990 levels by 2020 and 80% below 2001 levels by 2050 (State of Connecticut 2008).
Control of Carbon Dioxides Emissions/CO_2 Budget Trading Program (2008)	Sets forth statutory requirements to establish a carbon dioxide (CO_2) allowance tracking system wherein CO_2 allowance allocations are established under the Connecticut CO_2 Budget Trading Program Base Budget. Budget sources are identified, cataloged, monitored and reported, transferred, and tracked under a certification program in an effort to cap and reduce power sector CO_2 emissions.
Regional Greenhouse Gas Initiative (RGGI) (2009)	The nation's first mandatory, market-based cap-and-trade program to reduce emissions of CO_2. Under the program, which began in 2009, participating RGGI states (Rhode Island, Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New York, Vermont, and New Jersey; New Jersey withdrew in 2011) established a regional cap on CO_2 emissions from fossil fuel–fired electric generating facilities, and required these power plants to possess a tradable CO_2 allowance for each ton of CO_2 they emit. Under RGGI, CO_2 allowances are distributed through quarterly allowance auctions.
An Act Concerning Electric and Fuel Cell Electric Vehicles (Public Act 16-135) (2016)	Sets forth several provisions related to electric vehicles (EVs), including requirements related to data collection, EV charging stations, and electric rate structures.
Building A Low Carbon Future for Connecticut: Achieving a 45% GHG reduction by 2030 (2018)	Proposed set of strategies to achieve 45% GHG reduction below 2001 levels target by 2030. These strategies ensure Connecticut is on a downward trajectory to the 80% reduction target by 2050 required by the Global Warming Solutions Act (State of Connecticut 2018a).
2018 Act Concerning Climate Change Planning and Resiliency (Public Act 18-82)	Act passed by the Connecticut General Assembly that adopted GC3's recommendation of 45% GHG mid-term reduction target below 2001 levels by 2030 and integrates GHG reduction more explicitly into the DEEP Comprehensive Energy Strategy (CES) and Integrated Resource Plan (IRP) (State of Connecticut 2018b).
Comprehensive Energy Strategy (CES) (2018)	Connecticut Department of Energy and Environmental Protection (DEEP) update to Connecticut's CES to advance the State's goal of creating a cheaper, cleaner, more reliable energy future for Connecticut's residents and businesses. The CES analyzes energy use and key trends of the region (State of Connecticut 2018c)
Executive Order No. 3, (2019)	Re-establishes and expands the membership and responsibilities of the Governor's Council on Climate change (GC3), originally established in 2015. Orders GC3 to report to the Governor regarding the state's progress on the implementation of the strategies identified in *Building a Low Carbon Future for Connecticut: Achieving a 45% GHG reduction by 2030* (State of Connecticut 2019)

Plans and Policies	Summary/Goal
Integrated Resources Plan (2020)	DEEP is required to prepare an Integrated Resource Plan (IRP) every 2 years, which is comprised of an assessment of the future electric needs and a plan to meet those future needs. Executive Order 3 directed DEEP to analyze pathways and recommend strategies to achieve a 100 percent zero carbon electric supply by 2040 in this IRP (State of Connecticut 2020).
Taking Action on Climate Change and Building a More Resilient Connecticut for All (2021)	Phase 1 report in response to Executive Order 3's request for progress on mitigation strategies and preparation of an Adaptation and Resilience Plan. Provides information on GC3 members and Working Group members, GC3 background and process, the Equity and Environmental Justice Working Group, the impacts of climate change in Connecticut, and recommendations for near-term action (State of Connecticut 2021)
Massachusetts	
Global Warming Solutions Act (GWSA) of 2008	Framework to reduce GHG emissions by requiring 25% reduction in emissions from all sectors below 1990 baseline emission level in 2020, at least 80% reduction in 2050. Full implementation of these policies is projected to result in total net reduction of 25.0 million metric tons of CO_2 equivalent, or 26.4% below 1990 baseline level (Commonwealth of Massachusetts 2018a).
Massachusetts Clean Energy and Climate Plan (CECP) for 2020; 2015 CECP Update	Policies that aim to reduce GHG emissions in the commonwealth across all sectors; full implementation of policies would result in reducing emissions by at least 25% below 1900 level in 2020 (Commonwealth of Massachusetts 2015).
Executive Order 569, Establishing an Integrated Climate Strategy for the Commonwealth and "Act to Promote Energy Diversity" (2016)	Calls for large procurements of offshore wind and hydroelectric resources (Commonwealth of Massachusetts 2016).
Environmental Bond Bill and An Act to Advance Clean Energy (2018)	Sets new targets for offshore wind, solar, and storage technologies; expands Renewable Portfolio Standard requirements for 2020–2029; establishes a Clean Peak Standard; and permits fuel switching in energy efficiency programs (Commonwealth of Massachusetts 2018a).
Massachusetts State Hazard Mitigation and Climate Adaption Plan 2018	Updated 2013 plan to comprehensively integrate climate change impacts and adaptation strategies with hazard mitigation planning while complying with federal requirements for state hazard mitigation plans and maintaining eligibility for federal disaster recovery and hazard mitigation funding under the Stafford Act. The plan will next be submitted to the Federal Emergency Management Agency (FEMA) for approval. In 2020, a new 2030 emissions limit and CECP for 2030 will be published (Commonwealth of Massachusetts 2018a, 2018b).
Massachusetts 2050 Decarbonization Roadmap	A planning process by the Massachusetts Executive Office of Energy and Environmental Affairs to identify cost-effective and equitable strategies to ensure Massachusetts reduces GHG emissions by at least 85% by 2050 and achieves net-zero emissions (Commonwealth of Massachusetts 2020a)

Plans and Policies	Summary/Goal
Massachusetts Clean Energy and Climate Plan (CECP) for 2030	The Clean Energy and Climate Plan for 2030 (2030 CECP) provides details on the actions the Commonwealth will undertake through the next decade to ensure the 2030 emissions limit is met. The 2030 CECP is prepared in coordination with the development of the 2050 Decarbonization Roadmap such that the strategies, policies, and actions outlined in the 2030 CECP can help the Commonwealth achieve net zero GHG emissions by 2050. The Interim 2030 CECP was built upon the 2020 CECP and the 2015 CECP Update (Commonwealth of Massachusetts 2020b).
2030 GHG Emissions Limit	The 2030 emissions limit of 45% below the 1990 GHG emissions level was set on December 30, 2020, in accordance with Executive Order 569 to help the Commonwealth meet the 2050 emissions limit (Commonwealth of Massachusetts 2020c)
Net Zero by 2050 Emissions Limit	A 2050 statewide emissions limit of net zero GHG emissions was established by the Commonwealth. This is defined as a level of statewide GHG emissions that is equal in quantity to the amount of CO_2 or its equivalent that is removed from the atmosphere and stored annually by, or attributable to, the Commonwealth; provided, however, that in no event shall the level of emissions be greater than a level that is 85 percent below the 1990 level (Commonwealth of Massachusetts 2020d).
New York	
Reforming the Energy Vision (New York State 2014)	State's energy policy to build integrated energy network; Clean energy goal to reduce GHGs by 40% by 2030 and by 80% by 2050.
Order Adopting a Clean Energy Standard (State of New York Public Service Commission 2016)	Requirement that 50% of New York's electricity come from renewable energy sources by 2030.
New York State Energy Plan 2015; 2017 Biennial Report to 2015 Plan (New York State Energy Research Development Authority [NYSERDA] 2015, 2017a)	Requires 40% reduction in GHGs from 1990 levels; 50% electricity will come from renewable energy resources; and 600 trillion British thermal units (Btu) increase in statewide energy efficiency.
Governor Cuomo State of State Address 2017, 2018, 2021	2017: Set offshore wind energy development goal of 2,400 MW by 2030 (Governor's Office 2017a). 2018: Procurement of at least 800 MW of offshore wind power between two solicitations in 2018 and 2019; new energy efficiency target for investor-owned utilities to more than double utility energy efficiency progress by 2025; energy storage initiative to achieve 1,500 MW of storage by 2025 and up to 3,000 MW by 2030 (Governor's Office 2018a, 2018b). 2021: The governor's 2021 agenda—Reimagine | Rebuild | Renew—establishes a goal of building out its renewable energy program. The agenda notes the development of two new offshore wind farms more than 20

Plans and Policies	Summary/Goal
	miles off the shore of Long Island, the creation of dedicated offshore port facilities, and additional transmission capacity development.
New York State Offshore Wind Master Plan (2017) (NYSERDA 2017b)	Grants NYSERDA ability to award 25-year long-term contracts for projects ranging from approximately 200 MW to approximately 800 MW, with an ability to award larger quantities if sufficiently attractive proposals are received. Each proposer is also required to submit at least one proposal of approximately 400 MW. Bids are due in February 2019, awards are expected in spring 2019; and contracts are expected to be executed thereafter.
2020 Offshore Wind Solicitation	As noted above, NYSERDA has provisionally awarded two offshore wind projects, totaling 2,490 MW. Empire Wind 2 (1,260 MW) and Beacon Wind (1,230 MW) of Equinor Wind US LLC 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	CLCPA establishes economy-wide targets to reduce GHG emissions by 40% of 1990 levels by 2030 and 85% of 1990 levels by 2050.
Rhode Island	
Air Pollution Control Regulation No. 37-Rhode Island's Low-Emission Vehicle Program (2001)	The purpose of this regulation is to specify the requirements for Rhode Island’s Low-Emission Vehicle Program to reduce motor vehicle GHG emissions.
Air Pollution Control Regulation No. 46, 'CO2 Budget Trading Program' (2008)	The purpose of this regulation is to establish the Rhode Island component of the CO_2 Budget Trading Program, which is designed to reduce anthropogenic emissions of CO_2 from the CO_2 budget sources in an economically efficient manner. Budget sources are identified, cataloged, monitored and reported, transferred, and tracked under a certification program in an effort to cap and reduce power sector CO_2 emissions.
RGGI (2009)	The RGGI is the nation's first mandatory, market-based cap-and-trade program to reduce emissions of CO_2. Under the program, which began in 2009, Rhode Island receives CO_2 allowance proceeds, which are invested in a variety of consumer benefit programs, including energy efficiency, renewable energy, direct energy bill assistance and other GHG reduction programs.

Plans and Policies	Summary/Goal
Resilient Rhode Island Act (2014)	Established the Executive Climate Change Coordinating Council (EC4) and set specific GHG reduction targets; incorporates consideration of climate change impacts into the powers and duties of all state agencies (State of Rhode Island 2014).
Energy 2035 Rhode Island State Energy Plan (2015)	Long-term comprehensive strategy for energy services across all sectors using a secure, cost-effective, and sustainable energy system; plan to increase sector fuel diversity, produce net economic benefits, and reduce GHG emissions by 45% by the year 2035 (State of Rhode Island 2015b).
Governor's Climate Priorities (2018) Executive Order 15-17, 17-06	Increasing in-state renewable energy tenfold by 2020 (to 1,000 MWs) through new development and regional procurement (State of Rhode Island 2015a, 2017, 2018a).
Rhode Island Greenhouse Gas Emissions Reductions Plan (2016)	Targets for GHG reductions: 10% below 1990 levels by 2020; 45% below 1990 levels by 2035; 80% below 1990 levels by 2040 (State of Rhode Island 2016).
Resilient Rhody (2018)	Planning document outlining climate resiliency actions; focuses on leveraging emissions reduction targets and adaptation (State of Rhode Island 2018b).
Executive Order 20-01, Advancing a 100% Renewable Energy Future for Rhode Island by 2030	Calls the Rhode Island Office of Energy Resources (OER) to conduct economic and energy market analyses to develop an actionable plan to reach 100% renewable electricity by 2030. The OER must provide this specific and implementable action plan by December 31, 2020 (State of Rhode Island 2020a).
The Road to 100% Renewable Electricity by 2030 in Rhode Island	Provides economic analysis of the key factors that will guide Rhode Island in the coming years as the state accelerates its adoption of carbon-free renewable resources. The OER developed specific policy, programmatic, planning, and equity-based actions that will support achieving the 100% renewable electricity goal (Rhode Island OER 2020).
2021 Act on Climate	This legislation updates Rhode Island's climate-emission reduction goals laid out in the 2014 Resilient RI Act and address areas such as environmental injustices, public health inequities, and a fair employment transition as fossil-fuel jobs are replaced by green energy jobs. The state will develop a plan to incrementally reduce climate emissions to net-zero by 2050 and is to be updated every 5 years (State of Rhode Island 2020b).

Table E-5. Resiliency Plans and Policies in the Lease Area

Plans and Policies	Summary
Connecticut	

Plans and Policies	Summary
Act Authorizing Municipal Climate Change and Coastal Resiliency Reserve Funds (CCCRRF) (Public Act 19-77)	Act approved July 1, 2019. Upon the recommendation of the chief elected official and budget-making authority, and approval of the legislative body of a municipality, the reserve fund may be used and appropriated to pay for municipal property losses, capital projects and studies related to mitigating hazards and vulnerabilities of climate change including, but not limited to, land acquisition (Connecticut General Assembly 2019).
Resilient Connecticut	Connecticut Institute for Resilience & Climate Adaptation (CIRCA) was awarded an $8 million from the National Disaster Relief Competition(NDRC) to develop the *Resilient Connecticut* project. Coordination of CIRCA, state agencies, and regional councils of governments and municipalities initiated the development of a Planning Framework to establish resilient communities through smart planning that incorporates economic development framed around transit-oriented development, conservation strategies, and critical infrastructure improvements (Resilient Connecticut (CIRCA 2021).
An Act Concerning Climate Change Adaptation (Public Act 21-115)	Act approved July 6, 2021. This proposal addresses the rising seas, frequent flooding, heat waves, and drought expected between now and 2050. It prioritizes the protection of frontline vulnerable communities and provides Connecticut's communities more options to move from adaptation and resilience planning to implementing their project pipeline, including the use of nature-based and green infrastructure solutions (Connecticut General Assembly 2021).
Massachusetts	
Municipal Vulnerability Preparedness grant program (MVP) (2017)	Provides support for cities and towns to plan for resiliency and implement key climate change adaptation actions for resiliency. The City of New Bedford has received MVP designation as of November 1, 2018 (Commonwealth of Massachusetts 2019a).
Coastal Grant and Resilience Program	Provides financial and technical support for local efforts to increase awareness and understanding of climate impacts, identify and map vulnerabilities, conduct adaptation planning, redesign vulnerable public facilities and infrastructure, and implement non-structural approaches that enhance natural resources and provide storm damage protection (Commonwealth of Massachusetts 2019b).
General Appropriations Bill, FY2022 (Section 2000-0101)	Designation of funds for the Executive Office of Energy and Environmental Affairs to coordinate and implement strategies for climate change adaptation and preparedness, including, but not limited to, resiliency plans for the commonwealth in a report to be delivered by February 3, 2022 (Commonwealth of Massachusetts Legislature 2021).
Nantucket's Coastal Resilience Plan	The plan is currently under development, and while no actions have been identified to date, potential shoreline management activities could include sediment management, construction of seawalls and similar structures, and other activities (Town and County of Nantucket 2018a, 2018b).

Plans and Policies	Summary
New York	
Part 490 of Community Risk and Resiliency Act (CRRA) of 2014	Establishes statewide science-based sea-level rise projections for coastal regions of the state. As of 2019, DEC is in the process of developing a State Flood Risk Management Guidance document for state agencies (New York State Department of Environmental Conservation [NYSDEC] n.d. [2019]).
NY Rising Community Reconstruction (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 2018b).
Water Infrastructure Improvement Act (WIIA), Water Quality Improvement Project (WQIP) Program, and Intermunicipal Grant (IMG)	$600 million available to communities statewide for programs to fund projects to upgrade infrastructure and make communities more resilient to flooding and other impacts of climate-driven severe storms and weather events (Governor's Office 2021).
Rhode Island	
Shoreline Change Special Area Management Plan (Beach SAMP)	The RI CRMC developed and adopted the Beach SAMP to improve the state's resilience and manage the shoreline (RI CRMC 2018b).
Regional	
New England Governor's and Eastern Canadian Premiers (NEG/ECP) Regional Climate Change Initiative	The NEG/ECP Regional Climate Change Initiative includes seven New England states (Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont). This initiative encourages advancement of regional discussions and collaborative efforts to reduce greenhouse gas emissions by identifying strategies, policies, and measures through which the region could achieve its 2030 reduction marker and 2050 target (NEG/ECP 2022).

Oil and Gas Activities

The Project would be located in the North Atlantic Planning Area of the OCS Oil and Gas Leasing Program (National OCS Program). On September 8, 2020, the White House issued a presidential memorandum for the Secretary of the Interior on the withdrawal of certain areas of the U.S. OCS from leasing disposition for 10 years, including the areas currently designated by BOEM as the South Atlantic and Straits of Florida Planning Areas (The White House 2020a). The South Atlantic Planning Area includes the OCS off South Carolina, Georgia, and northern Florida. On September 25, 2020, the White House issued a similar memorandum for the Mid-Atlantic Planning Area that lies south of the northern administrative boundary of North Carolina (The White House 2020b). This withdrawal prevents consideration of these areas for any leasing for purposes of exploration, development, or production during the 10-year period beginning July 1, 2022, and ending June 30, 2032. However, at this time, there has been no decision by the Secretary of the Interior regarding future oil and gas leasing in the North Atlantic or remainder of the Mid-Atlantic Planning Areas. Existing leases in the withdrawn areas are not affected.

BOEM issues geological and geophysical (G&G) permits to obtain data for hydrocarbon exploration and production; locate and monitor marine mineral resources; aid in locating sites for alternative energy structures and pipelines; identify possible human-made, seafloor, or geological hazards; and locate potential archeological and benthic resources. G&G surveys are typically classified into the following categories by equipment and survey type:

- Deep-penetration seismic air gun surveys (2-D, 3-D, 4-D, ocean-bottom nodal, and azimuth multi-vessel surveys)
- Air gun HRG surveys that are used to investigate the shallow subsurface for geohazards (also known as shallow hazard surveys) and that are used during initial site evaluation, drilling rig emplacement, and platform or pipeline design and emplacement
- Electromagnetic surveys, deep stratigraphic and shallow test drilling, and various remote-sensing methods
- Non-air gun HRG surveys (similar to those used to support OCS wind energy leasing and site assessment activities) to detect and monitor geohazards, archaeological resources, and benthic communities
- Geological and geotechnical seafloor sampling (similar to those used to support OCS wind energy leasing and site assessment activities) to assess the suitability of seafloor sediments for supporting structures (e.g., platforms, pipelines, and cables)

Detailed information on each of the specific G&G survey types and descriptions can be found in Appendix F of *Gulf of Mexico OCS Proposed Geological and Geophysical Activities: Western, Central, and Eastern Planning Areas; Final Programmatic Environmental Impact Statement* (BOEM 2017).

There are currently no G&G permits under BOEM review for areas offshore of the northeast Atlantic states; however, areas under consideration for G&G surveys are located in federal waters offshore from Delaware to Florida (BOEM 2021b).

Eight LNG ports are located on the East Coast of the United States. Table E-6 lists existing, approved, and proposed LNG ports on the East Coast of the United States that provide (or may in the future provide) services such as natural gas export, natural gas supply to the interstate pipeline system or local distribution companies, or storage of LNG for periods of peak demand, or production of LNG for fuel and industrial use (FERC 2021).

Table E-6. Liquid Natural Gas Terminals Located in the Northeastern United States

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

Source: FERC (2021)

Onshore Development Activities

Onshore development activities that may contribute to impacts from planned activities include visible infrastructure such as onshore wind turbines and cell towers, port development, and other energy projects such as transmission and pipeline projects. Coastal development projects permitted through regional planning commissions and towns may also contribute to impacts from planned activities. These may include residential, commercial, and industrial developments spurred by population growth in the region (Table E-7).

Table E-7. Existing, Approved, and Proposed Onshore Development Activities

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

<table>
<tr><th>Type</th><th>Description</th></tr>
<tr><td></td><td>The USACE is working to remediate and cleanup a former defense site (former NIKE Battery PR-58 and Disaster Village Training Area) at Quonset Development Corporation in North Kingstown, RI. A feasibility study was performed from 2014 to 2016, and the final remedial investigation/feasibility study was published in 2016. Pre-design investigations, followed by remedial designs and engineering plans, and remedial action is proposed for 2021 (USACE 2018g).
The Massachusetts Department of Environmental Protection (MassDEP) Bureau of Air and Waste approved National Grid's application for the construction and operation of a diesel generator and a battery electric storage system at an existing electric generating facility located at 32 Bunker Road in Nantucket, approximately 1 mile north of the coastline. The facilities are anticipated to be operational in 2019 (MassDEP 2017; Utility Dive 2018).</td></tr>
<tr><td>Port studies/upgrades</td><td>The USACE completed the Lake Montauk Harbor Feasibility Study in 2020. The study determined that Lake Montauk Harbor has insufficient channel and depth to support commercial fishing fleet activities. The study evaluated a range of alternative navigation improvement plans; the recommended plan consisted of deepening the existing navigation channel to -17 feet MLLW depth, creating a deposition basin immediately east of the channel at a width of 100 feet, and placing dredged material on the shoreline west of the inlet for a distance of 3,000 feet and a width of approximately 44 feet.

Ports in New York, Connecticut, Rhode Island, and Massachusetts may require upgrades to support the offshore wind industry developing in the northeastern United States. Upgrades may include onshore developments or underwater improvements (such as dredging).
In December 2017, NYSERDA issued an offshore wind master plan that assessed 54 distinct waterfront sites along the New York Harbor and Hudson River and 11 distinct areas with multiple small sites along the Long Island coast. Twelve waterfront areas and five distinct areas were singled out for "potential to be used or developed into facilities capable of supporting OSW projects" (Table 26; NYSERDA 2017b). Nearly all identified sites would require some level of infrastructure upgrade (from minimal to significant) depending on OSW activities intended for the site. Particular sites of interest include Red Hook-Brooklyn, South Brooklyn Marine Terminal, and the Port of Coeymans (NYSERDA 2017b). For additional information regarding specific proposed improvements to these ports, see DockNYC (2018), Capital Region Economic Development Council (2018), American Association of Port Authorities (2016), Rulison (2018), and New York City Economic Development Corporation (2018).
The CPA is currently evaluating proposals from parties to develop, finance, and manage the Connecticut State Pier in New London under a long-term operating agreement (CPA 2018b). According to the Connecticut Maritime Strategy 2018 (CPA 2018a), New London is the only major port between New York and Maine that does not have vertical obstruction and offshore barriers, two factors that are critical for offshore wind turbine assembly. The document includes strategic objectives to manage and redevelop the Connecticut State Pier partially to support the offshore wind industry, which could create a dramatic increase in demand for the Connecticut State Pier and regional job growth. Redevelopment of the State Pier is considered a reasonably foreseeable activity, though specific redevelopment plans are not yet available.
In Rhode Island, DWW has committed to investing approximately $40 million in improvements at the Port of Providence, the Port of Davisville at Quonset Point, and possibly other Rhode Island ports for the Revolution Wind Project (Kuffner 2018). The</td></tr>
</table>

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

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APPENDIX E1

Description and Screening of Relevant Offshore Wind and Non–Offshore Wind Impact-Producing Factors and Negligible Impact Determinations

Contents

Tables

Introduction

The Bureau of Ocean Energy Management (BOEM) developed the tables in Appendix E1 for each resource category based on the 2019 study titled *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). The next page provides an overview table of the impact-producing factors (IPFs) considered for each resource in the environmental impact statement (EIS).

Tables E1-1 to E2-21 provide an analysis of the relevant ongoing and future non–offshore wind (OSW) activities by IPF for each resource, as well as a reference to where in the Revolution Wind Farm and Revolution Export Cable Project EIS each of those IPFs is analyzed in relation to future OSW activities and the Proposed Action and alternatives, if applicable. Some IPFs were determined either not applicable or to have negligible impacts and therefore do not warrant detailed analysis in the EIS pursuant to 40 Code of Federal Regulations (CFR) 1502.15. In these cases, IPF analysis is solely provided in Tables E1-1 to E2-21.

A full list of abbreviations is provided in the EIS's Abbreviations section. Please refer to this section for abbreviations used in the tables in this appendix.

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Appendix E1 Overview Table

IPFs	Air		Bats		Benthic Habitat and Invertebrates		Birds		Coastal Habitats and Fauna		Commercial Fisheries and For-Hire Recreational Fishing		Cultural Resources		Demographics, Employment, and Economics		Environmental Justice		Finfish and Essential Fish Habitat		Land Use and Coastal Infrastructure		Marine Mammals		Navigation and Vessel Traffic		Other Marine Uses		Recreation and Tourism		Sea Turtles		Visual Resources		Water Quality		Wetlands and Non-Tidal Waters	
	Off	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**	**Off**	**On**
Accidental releases	X	X			X		X	X			X		X	X				X	X		X	X	X				X	X			X				X	X		X
Air emissions	X	X															X	X																				
Anchoring					X						X		X						X						X				X	X	X				X			
Bycatch					X																		X								X							
Discharges					X													X									X	X							X	X		X
Electromagnetic fields					X														X		X	X	X								X							
Energy generation, energy security															X																							
Light			X	X	X		X	X			X		X	X	X		X		X		X	X	X				X	X	X	X	X		X	X				
New cable emplacement and maintenance				X	X		X	X		X	X		X	X	X		X	X	X		X	X	X		X		X	X	X	X	X				X	X		
Noise			X	X	X		X	X		X	X						X	X	X		X	X	X				X	X	X	X	X							
Port utilization					X							X				X			X		X	X	X		X		X	X	X	X	X				X	X		
Presence of structures			X	X	X		X	X		X	X		X	X	X		X	X	X		X	X	X		X		X	X	X	X	X		X	X	X	X		X
Fisheries management activities											X																											
Sediment deposition and burial					X														X				X								X							X
Traffic					X		X	X			X				X	X	X	X	X				X		X	X	X		X	X	X							
Climate change	X	X			X		X	X		X	X		X	X	X		X		X				X				X	X			X							
Ocean acidification					X		X	X											X				X								X							

Notes: Off = Offshore, On = Onshore

Air Quality

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

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Fuel/fluids/ hazmat	Accidental releases of air toxics or HAPS are due to potential chemical spills. Ongoing releases occur in low frequencies. These could 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 (2021), which collects data on oil spills from tankers and other sources. From 1990 to1999, the average annual input to the coastal Northeast was 220,000 barrels of petroleum and offshore it was less than 70,000 barrels. Approximately 253,000 gallons of coolants, oils and lubricants, and fuel is estimated to be stored within WTG foundations and the OSS within the GAA for existing and permitted OSW COP projects. All OSW projects are required to comply with regulatory requirements related to the prevention and control of accidental spills administered by the USCG and BSEE.	Accidental releases of air toxics or HAPS would be due to potential chemical spills. Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases. These could 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 quality impacts associated with accidental spills from other reasonably foreseeable projects could also occur; however, releases would be short term, localized, and generally small in volume and would not contribute to air quality in measurable amounts. Therefore, impacts to air quality would be **negligible** adverse. See Table E1-4 for a quantitative analysis of these risks.	**Offshore:** The Proposed Action and Alternatives C through F would result in air quality impacts from air emissions associated with accidental spills during construction and installation. Releases would be short term, localized, and generally small in volume and would not contribute to air quality in measurable amounts. Construction under Alternatives C through F could result in a reduced risk of inadvertent spills due to the reduced number of installed WTGs, resulting in a potential decrease in Project-related spill emissions. However, impacts to air quality under the Proposed Action and Alternatives C through F would still be **negligible** adverse. Once the RWF has been constructed, spills are unlikely. Air quality impacts associated with any accidental spills would be short term, localized, and generally small in volume and would not contribute to air quality in measurable amounts. Alternatives C through F would result in O&M and decommissioning impacts to air quality at quantities and durations similar to, or slightly reduced from, the Proposed Action. However, impacts to air quality under the Proposed Action and Alternatives C through F would be **negligible** adverse. BOEM estimates that the Proposed Action and Alternatives C through F would result in up to an 11% incremental increase in total chemical usage over the No Action Alternative in the water quality GAA. However, with the implementation of EPMs and compliance with regulations, the incremental additional effects of accidental releases from the Proposed Action would not contribute appreciably to overall impacts on air quality. Project-related accidental spills or discharges, including those associated with vessel allisions or collisions, associated with Alternatives C through F would result in air quality impacts at quantities and durations similar to, or slightly reduced from, the	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, construction and installation, O&M, and cumulative impacts would be **negligible** adverse.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				Proposed Action. Therefore, when combined with past, present, and reasonably foreseeable projects, the Proposed Action and Alternatives C through F would result in **negligible** adverse cumulative impacts to air quality due to accidental releases.	
				Onshore: Inadvertent spills in onshore waters during construction, such as the release of fuels and oils from vehicles or infrastructure, which would disperse rapidly, would be classified as routine and would be localized, short term, and minor (BOEM 2015). Therefore, **negligible** adverse impacts to air quality from onshore spills are anticipated from the Proposed Action during construction and installation and O&M. The Proposed Action when combined with past, present, and other reasonably foreseeable projects would also result in short-term and **negligible** adverse cumulative impacts on air quality. Alternatives C through F would not impact onshore activities; therefore, impacts would be the same as those described for the Proposed Action: **negligible** adverse.	**Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, construction and installation, O&M, and cumulative impacts would be **negligible** adverse.
Air emissions: Construction and decommissioning	Air emissions originate from combustion engines and electric power generated by burning fuel. These activities are regulated under the CAA to meet set standards. Air quality has generally improved over the last 35 years; however, some areas in the Northeast have experienced a decline in air quality over the last 2 years. Some areas of the Atlantic Coast remain in nonattainment for O_3, with the source of this pollution from power generation. Many of these states have made commitments toward cleaner energy goals to improve this, and OSW is part of these goals. Primary processes and activities that could 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. Construction of permitted OSW projects in the GAA is estimated to generate tons of 1,451 NO_X, 33 tons of SO_2, 49 tons of PM_{10}, and 97,026 tons of CO_2. Operation of permitted and built OSW projects in the GAA	The largest air quality impacts over the next 35 years would occur during the construction phase of any one project; however, projects would be required to comply with the CAA. During the limited construction and decommissioning phases, emissions could occur that are above de minimis thresholds and would require offsets and mitigation. Primary emission sources would be due to increased commercial vehicular traffic, air traffic, public vehicular traffic, and combustion emissions from construction equipment as well as 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.	See Section 3.4.2.2.2 for analysis.	See Section 3.4.2.3 and Section 3.4.2.1, Table 3.4-5 for analysis.	See Section 3.4.2.1, Table 3.4-5 for analysis.
Air emissions: O&M		Activities associated with O&M of onshore wind projects would have a proportionally very small contribution to emissions compared to construction and decommissioning activities over the next 35 years. Emissions would largely be due to commercial vehicular traffic and operation of	See Section 3.4.2.2.2 for analysis.	See Section 3.4.2.3 and Section 3.4.2.1, Table 3.4-5 for analysis.	See Section 3.4.2.1, Table 3.4-5 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	is estimated to generate 303 tons of NO_X, 2 tons of SO_2, 11 tons of PM_{10}, and 20,466 tons of CO_2. This volume represents a negligible increase to county emissions; additionally, only a portion of the generated emissions would actually reach nearby counties and would depend on wind conditions at the time the emissions are generated.	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 OSW playing a large role. Other reductions include transitioning to onshore wind and solar. The No Action Alternative without implementation of other future OSW projects could result in increased air quality impacts regionally due to the need to construct and operate new energy generation facilities to meet future power demands. Unless substituted by other, non-OSW sources, these facilities could consist of new natural gas–fired power plants or 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.	See Section 3.4.2.2.2 for analysis.	See Section 3.4.2.3 and Section 3.4.2.1, Table 3.4-5 for analysis.	See Section 3.4.2.1, Table 3.4-5 for analysis.
Climate change	Constructed and permitted OSW 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. Hence, the impact of GHG emissions does not depend upon the source location. Increasing energy production from OSW projects would likely decrease GHG emissions by replacing energy from fossil fuels.	Development of future onshore wind projects would produce a small overall increase in GHG emissions over the next 35 years. However, these contributions would be very small compared to the aggregate global emissions. The impact on climate change from these activities would be very small. As more projects come online, some reduction in GHG emissions would be expected 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.	See Section 3.4.2.2.2 for analysis.	See Section 3.4.2.3 and Section 3.4.2.1, Table 3.4-5 for analysis.	See Section 3.4.2.1, Table 3.4-5 for analysis.

* Includes all constructed and permitted COP projects that occur within the air quality GAA: Block Island, SFWF.

Bats

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

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Noise: Pile driving	Noise from pile driving associated with permitted OSW COP projects is occurring during installation of foundations for offshore structures. Noise from pile driving also occurs	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	See Section 3.5.2.2.2 for analysis.	See Section 3.5.2.3 and Section 3.5.2.1, Table 3.5-1 for analysis during offshore activities.	See Section 3.5.2.1, Table 3.5-1 for analysis during offshore activities.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	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 could be less sensitive to temporary threshold shifts than other terrestrial mammals (Simmons et al. 2016). Indirect impacts (i.e., displacement from potentially suitable habitats) could occur as a result of construction activities, which could generate noise sufficient to cause avoidance behavior (Schaub et al. 2008). Construction activity would be temporary and highly localized. No pile-driving noise is anticipated for built OSW COP projects in the GAA.	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: Onshore Construction	Noise from onshore construction associated with permitted OSW COP projects is occurring during installation of various project components (cables, substation etc.). Other onshore construction occurs regularly for generic infrastructure projects in the bats GAA. 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 could be disturbed during construction but would be expected to move to a different roost farther from construction noise. This behavior 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). No onshore construction noise is anticipated for built OSW COP projects in the GAA.	Onshore construction is expected to continue at current trends. Some behavioral responses and avoidance of construction areas could occur (Schaub et al. 2008). However, no injury or mortality would be expected.	See Section 3.5.2.2.2 for analysis.	See Section 3.5.2.3 and Section 3.5.2.1, Table 3.5-1 for analysis during onshore activities.	See Section 3.5.2.1, Table 3.5-1 for analysis during onshore activities.
Presence of structures: Migration disturbances	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. There could also be a few non-OSW structures scattered throughout the offshore bats GAA, such as navigation and weather buoys and light towers (NOAA 2020a). Migrating bats can easily fly around or over these sparsely distributed structures, and no	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.	See Section 3.5.2.2.2 for analysis.	See Section 3.5.2.3 and Section 3.5.2.1, Table 3.5-1 for analysis.	See Section 3.5.2.1, Table 3.5-1 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	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.				
Presence of structures: Turbine strikes	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. There could also be a few non-OSW structures in the offshore bats GAA, such as navigation and weather buoys, turbines, and light towers (NOAA 2020a). 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.	See Section 3.5.2.2.2 for analysis.	See Section 3.5.2.3 and Section 3.5.2.1, Table 3.5-1 for analysis.	See Section 3.5.2.1, Table 3.5-1 for analysis.
New cable emplacement/maintenance	Constructed and permitted OSW COP projects are introducing new onshore cable in the GAA. Other non-OSW cable emplacement and maintenance activities are expected to continue to follow current trends. Potential direct effects on individuals could occur if these activities include tree removal when bats are potentially present. Injury or mortality could occur if trees being removed are occupied by bats at the time of removal. While there is some potential for indirect impacts associated with habitat loss, no individual or population-level effects would be expected.	Future non-OSW 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.	See Section 3.5.2.2.2 for analysis.	See Section 3.5.2.3 and Section 3.5.2.1, Table 3.5-1 for analysis during onshore activities.	See Section 3.5.2.1, Table 3.5-1 for analysis during onshore activities.
Light: Vessels	Nighttime vessel activity associated with permitted and built OSW COP projects is occurring during installation and O&M of various project components (cables, substation etc.). Ocean vessels have an array of lights, including navigational lights, deck lights, and interior lights. Bats could demonstrate attraction to or avoidance of construction vessels installing offshore facilities, particularly if insects (i.e., prey) are drawn to the lights of the vessels. 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.	No future activities were identified within the bats GAA other than ongoing activities.	See Section 3.5.2.2.2 for analysis.	See Section 3.5.2.3 and Section 3.5.2.1, Table 3.5-1 for analysis.	See Section 3.5.2.1, Table 3.5-1 for analysis.
Light: Structures	Constructed and permitted OSW COP projects are introducing 83 lighted structures into the	Light from onshore structures is expected to gradually increase in proportion with human	See Section 3.5.2.2.2 for analysis.	See Section 3.5.2.3 and Section 3.5.2.1, Table 3.5-1 for analysis.	See Section 3.5.2.1, Table 3.5-1 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	GAA. Buoys, towers, and onshore structures with lights could also attract bats. 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.	population growth along the coast. This increase is expected to be widespread and permanent near the coast but minimal offshore.			
Climate change: Warming and sea level rise, storm severity/frequency	Storms during breeding and roosting season could reduce productivity and increase mortality. Intensity of this impact is speculative.	No future activities were identified within the bats GAA other than ongoing activities.		Climate change, including increased storm severity/frequency and increased disease frequency, could impact bats. However, the intensity and extent of these potential impacts are speculative at this time; therefore, climate change is not discussed further in the context of potential impacts to bats.	Same as the Proposed Action and Alternatives C through F.
Climate change: Warming and sea level rise, increased disease frequency	Disease can weaken, lower reproductive output, and/or kill individuals. Some tropical diseases would move northward. Extent and intensity of this impact is highly speculative.	No future activities were identified within the bats GAA other than ongoing activities.		Climate change, including increased storm severity/frequency and increased disease frequency, could impact bats. However, the intensity and extent of these potential impacts are speculative at this time; therefore, climate change is not discussed further in the context of potential impacts to bats.	Same as the Proposed Action and Alternatives C through F.

* Includes all constructed and permitted COP projects that occur within the bats GAA: Block Island, SFWF, Vineyard Wind 1, Coastal Virginia Offshore Wind.

Birds

Table E1-3. Summary of Activities and the Associated Impact-Producing Factors for Birds

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Fuel/fluids/hazmat	Constructed and permitted OSW COP projects can accidentally release fuel, oils, or other hazardous materials in the GAA. See Table E1-4 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 result in feather oiling can lead to sublethal effects that include	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.	See Section 3.7.2.2.2 for analysis.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis.	See Section 3.7.2.1, Table 3.7-1 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	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. All vessels would comply with USCG requirements and BSEE regulations for the prevention and control of oil and fuel spills.				
Accidental releases: Trash and debris	Constructed and permitted OSW COP projects can potentially generate operational waste, including bilge and ballast water, sanitary and domestic wastes, and trash and debris in the GAA. Trash and debris are also accidentally discharged through onshore sources; fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation, navigation, and traffic; survey activities; and cable, line, 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 could 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). All vessels would adhere to federal, state, and local regulations regarding disposal of solid and liquid wastes.	As population and vessel traffic increase gradually over the next 35 years, accidental release of trash and debris could increase. This could 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.	See Section 3.7.2.2.2 for analysis.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis.	See Section 3.7.2.1, Table 3.7-1 for analysis.
Light: Vessels	Nighttime vessel activity associated with permitted and built OSW COP projects is occurring during installation and O&M of various project components (cables, substation etc.). 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 could 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.	See Section 3.7.2.2.2 for analysis during offshore activities.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.	See Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Light: Structures	Constructed and permitted OSW COP projects are introducing 83 lighted structures into the GAA. Buoys, towers, and onshore structures with lights can also 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.	See Section 3.7.2.2.2 for analysis.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis.	See Section 3.7.2.1, Table 3.7-1 for analysis.
New cable emplacement/ maintenance	Constructed and permitted OSW COP projects are introducing an estimated 498 miles of new offshore cable in the GAA. Other non-OSW cable emplacement and maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances would 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 would 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. Impacts would be temporary and localized, with no biologically significant impacts on individuals or populations.	See Section 3.7.2.2.2 for analysis.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis.	See Section 3.7.2.1, Table 3.7-1 for analysis.
Noise: Aircraft	Aircraft routinely travel in the GAA 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 could flush, resulting in nonbiologically 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 could flush, resulting in nonbiologically 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.	See Section 3.7.2.2.2 for analysis.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis.	See Section 3.7.2.1, Table 3.7-1 for analysis.
Noise: G&G	Noise from G&G surveys associated with permitted OSW COP projects may occur in the GAA. Infrequent site characterization surveys and scientific surveys produce high-	Same as ongoing activities, with the addition of possible future oil and gas surveys.	See Section 3.7.2.2.2 for analysis.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis.	See Section 3.7.2.1, Table 3.7-1 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	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.				
Noise: Pile driving	Noise from pile driving associated with permitted OSW COP projects is occurring during installation of foundations for offshore structures. Noise from pile driving also 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 pile-driving noise is anticipated for built OSW COP projects in the GAA.	No future activities were identified within the GAA for birds other than ongoing activities.	See Section 3.7.2.2.2 for analysis during offshore activities.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.	See Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.
Noise: Onshore construction	Noise from onshore construction associated with permitted OSW COP projects is occurring during installation of various project components (cables, substation etc.). Other onshore construction is routinely used in generic infrastructure projects. Equipment could cause displacement. Any displacement would only be temporary, and no individual fitness or population-level impacts would be expected. No onshore construction noise is anticipated for built OSW COP projects in the GAA.	Onshore construction would continue at current trends. Some behavior responses could range from escape behavior to mild annoyance, but no individual injury or mortality would be expected.	See Section 3.7.2.2.2 for analysis during onshore activities.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis during onshore activities.	See Section 3.7.2.1, Table 3.7-1 for analysis during onshore activities.
Noise: Vessels	Noise from vessel activity associated with permitted and built OSW COP projects is occurring during installation and O&M of various project components (cables, substation etc.). Other ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Sub-	No future activities were identified within the GAA for birds other than ongoing activities.	See Section 3.7.2.2.2 for analysis during offshore activities.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.	See Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	surface noise from vessels could disturb diving birds foraging for prey below the surface. The consequence to birds would be similar to noise from G&G but likely less because noise levels are lower.				
Presence of structures: Entanglement, gear loss, gear damage	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. Additionally, 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 GAA for birds other than ongoing activities.	See Section 3.7.2.2.2 for analysis during offshore activities.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.	See Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.
Presence of structures: Fish aggregation	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. 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 local and can be short term to permanent. These fish aggregations can provide localized, short-term to permanent beneficial impacts to some bird species because they could increase prey species availability.	New cables, installed incrementally in the GAA for birds over the next 20 to 35 years would likely require hard protection atop portions of the cables (see New cable emplacement/maintenance row above). 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 could increase. These impacts are expected to be local and could be short term to permanent. These fish aggregations can provide localized short-term to permanent beneficial impacts on some bird species due to increased prey species availability.	See Section 3.7.2.2.2 for analysis during offshore activities.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.	See Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.
Presence of structures: Migration disturbances	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. There could also be a few non-OSW structures scattered about the offshore GAA for birds, such as navigation and weather buoys and light towers (NOAA 2020a). Migrating birds could 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.	See Section 3.7.2.2.2 for analysis during offshore activities.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.	See Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.
Presence of structures: Turbine strikes, displacement, and attraction	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. There could also be a few non-OSW structures in the offshore GAA for birds, such as navigation and weather buoys, turbines, and light towers (NOAA 2020a). Given the limited number of structures currently in the GAA, individual and population-level impacts	The installation of future new structures in the marine or onshore environment over the next 35 years would not be expected to result in an increase in collision risk or displacement. Some potential for attraction and opportunistic roosting exists but would be expected to be limited given the anticipated number of structures.	See Section 3.7.2.2.2 for analysis during offshore activities.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.	See Section 3.7.2.1, Table 3.7-1 for analysis during offshore activities.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	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 could be attracted to these structures and opportunistically roost on these structures.				
Traffic	General aviation accounts for approximately two bird strikes per 100,000 flights (Dolbeer et al. 2019). Additionally, aircraft are used for scientific and academic surveys in marine environments.	Bird fatalities associated with general aviation would be expected to increase and follow the current trend in commercial air travel. Aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. These flights would be well below 100,000 flights, and no bird strikes would be expected to occur.	Aircraft flying at low altitudes and vehicle traffic could cause birds to flush, resulting in increased energy expenditure. Disturbance to birds, if any, would be temporary and localized, with impacts dissipating once the aircraft has left the area. General aircraft traffic accounts for approximately two bird strikes per 100,000 flights (Dolbeer et al. 2019). Because aircraft flights associated with OSW development would be minimal in comparison to baseline conditions, aircraft strikes with birds are rare. For this reason, aircraft traffic would not be expected to contribute to overall impacts on birds and as a result, BOEM expects no measurable impacts to birds from aircraft traffic. Planned future offshore projects, specifically wind projects, would result in increased short-term construction vessel traffic and long-term maintenance vessel traffic. Some of the vessel traffic from planned future projects would use designated shipping channels. Vessel traffic could cause seabirds to flush, resulting in temporary habitat loss (Schwemmer et al. 2011). Avoidance of shipping channels could result in long-term habitat loss and fragmentation; however, these adverse impacts would be short-term **negligible** as birds would become habituated to channeled traffic.	**Offshore:** Helicopters could be used for crew changes and construction support during installation of the WTGs; however, their use would be infrequent and used during foundation construction (see COP Appendix T [Tech Environmental 2023]). Vessel traffic associated with construction activities could flush birds in the path of vessels, causing temporary displacement from the area; however, impacts would be temporary and similar to baseline conditions because vessel traffic already occurs, resulting in similar temporary displacement of birds in the GAA (Stantec 2018). The expected adverse impacts of aircraft and vessel traffic associated with each alternative alone would not increase the impacts of this IPF beyond the impacts described under the No Action Alternative. Alternatives C through F would reduce the number of WTGs installed, potentially resulting in a reduced number of helicopter trips and vessel traffic required during construction. However, no measurable change from Proposed Action construction impacts to birds from this IPF is anticipated. Therefore, impacts under the Proposed Action and Alternatives C through F are expected to be short term **negligible** adverse. A hoist-equipped helicopter could be used to support O&M of the RWF; however, helicopter use would be infrequent (see COP Appendix T [Tech Environmental 2023]). Increases in vessel traffic during maintenance activities would be limited and infrequent. The expected adverse impacts to birds from aircraft and vessel traffic associated with the Proposed Action and Alternatives C through F alone would not increase the impacts of this IPF beyond the impacts described under the No Action Alternative: short term **negligible** adverse.	Similar impacts to the Proposed Action and Alternatives C through F. Therefore, construction and installation, O&M, and cumulative impacts would be **negligible** adverse.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				Aircraft flights associated with Project activities would be infrequent, and aircraft strikes with birds would be rare. Aircraft flights associated with other past, present, and reasonably foreseeable activities passing through the Lease Area would be minimal and infrequent. Vessel traffic could cause birds to flush, resulting in a temporary loss of habitat during construction activities associated with all Project alternatives. Impacts could be greater if avoidance and displacement of birds occur during seasonal migration periods. However, impacts would be temporary and similar to baseline conditions because vessel traffic already occurs in the GAA (Stantec 2018) and birds are habituated to regularly used shipping channels. In the context of reasonably foreseeable environmental trends, the combined aircraft and vessel traffic impacts from ongoing and planned actions, including the Proposed Action and Alternatives C through F, would be similar to the impacts under the No Action Alternative: long term **negligible** adverse.	
				Onshore: Aircraft traffic would not have an onshore impact on birds. Therefore, impacts would be **negligible** adverse under all alternatives.	Similar impacts to the Proposed Action and Alternatives C through F. Therefore, impacts would be **negligible** adverse.
Climate change: Warming and sea level rise, storm severity/frequency, altered habitat/ecology	Increased storm frequency and severity during the breeding season can reduce productivity of bird nesting colonies and kill adults, eggs, and chicks. Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 30 years, influencing the distribution of bird prey resources.	No future activities were identified within the GAA for birds other than ongoing activities.	See Section 3.7.2.2.2 for analysis.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis.	See Section 3.7.2.1, Table 3.7-1 for analysis.
Climate change: Ocean acidification	Increasing ocean acidification could affect prey species upon which some birds feed and could lead to shifts in prey distribution and abundance. Intensity of impacts on birds is speculative.	No future activities were identified within the GAA for birds other than ongoing activities.	See Section 3.7.2.2.2 for analysis.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis.	See Section 3.7.2.1, Table 3.7-1 for analysis.
Climate change: Warming and sea level rise, altered migration patterns	Birds rely on cues from the weather to start migration. Wind direction and speed influence the amount of energy used during migration. For nocturnal migrants, wind	No future activities were identified within the GAA for birds other than ongoing activities.	See Section 3.7.2.2.2 for analysis.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis.	See Section 3.7.2.1, Table 3.7-1 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	assistance is projected to increase across eastern portions of the continent (0.32 m/s; 9.6%) during spring migration by 2091, and wind assistance is projected to decrease within eastern portions of the continent (0.17 m/s; 6.6%) during autumn migration (La Sorte et al. 2018).				
Climate change: Warming and sea level rise, increased disease frequency	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 35 years, influencing the frequencies and distributions of various diseases of birds.	No future activities were identified within the GAA for birds other than ongoing activities.	See Section 3.7.2.2.2 for analysis.	See Section 3.7.2.3 and Section 3.7.2.1, Table 3.7-1 for analysis.	See Section 3.7.2.1, Table 3.7-1 for analysis.

* Includes all constructed and permitted COP projects that occur within the birds GAA: Block Island, SFWF, Vineyard Wind 1, Coastal Virginia Offshore Wind.

Water Quality

No IPFs with solely negligible impacts were identified.

Table E1-4. Summary of Activities and the Associated Impact-Producing Factors for Water Quality

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Fuel/fluids/ hazmat	Constructed and permitted OSW COP projects can accidentally release an estimated 200,000 gallons of fuel, oils, or other hazardous materials in the GAA. Accidental releases of fuels and fluids also occur during vessel usage for dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable, line, and pipeline laying activities. According to the 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 (2021), 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 < 70,000 barrels. Impacts on water quality would be expected to brief and localized from accidental releases.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities. Impacts are unlikely to affect water quality.	See Section 3.21.2.2.2 for analysis.	See Section 3.21.2.3 and Section 3.21.2.1, Table 3.21-1 for analysis.	See Section 3.21.2.1, Table 3.21-1 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	All vessels would comply with USCG requirements and BSEE regulations for the prevention and control of oil and fuel spills.				
Accidental releases: Trash and debris	Constructed and permitted OSW COP projects can potentially generate operational waste, including bilge and ballast water, sanitary and domestic wastes, and trash and debris in the GAA. Trash and debris could be also accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities, and cable, line, 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. All vessels would adhere to federal, state, and local regulations regarding disposal of solid and liquid wastes.	As population and vessel traffic increase gradually over the next 35 years, accidental release of trash and debris could increase. However, there does not appear to be evidence that the volumes and extents anticipated would have any effect on water quality.	See Section 3.21.2.2.2 for analysis.	See Section 3.21.2.3 and Section 3.21.2.1, Table 3.21-1 for analysis.	See Section 3.21.2.1, Table 3.21-1 for analysis.
Anchoring	Constructed and permitted OSW COP projects are introducing an estimated 821 acres of anchoring in the GAA. Other non-OSW impacts from anchoring occur due to ongoing military use and survey, commercial, and recreational activities.	Impacts from anchoring could occur semiregularly over the next 35 years due to offshore military operations or survey activities. These impacts would include increased seafloor disturbance resulting in increased turbidity levels. All impacts would be localized, short term, and temporary.	See Section 3.21.2.2.2 for analysis within offshore waters. Anchoring would not impact onshore waters.	See Section 3.21.2.3 and Section 3.21.2.1, Table 3.21-1 for analysis within offshore waters. Anchoring would not impact onshore waters.	See Section 3.21.2.1, Table 3.21-1 for analysis within offshore waters. Anchoring would not impact onshore waters.
New cable emplacement/ maintenance	Constructed and permitted OSW COP projects are introducing an estimated 193 miles of new offshore cable in the GAA. Elevated suspended sediment concentrations can also 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 be limited to the emplacement corridor or localized.	Suspension of sediments could continue to occur infrequently over the next 35 years due to survey activities and submarine cable, line, 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 local short-term impacts. The FCC has two pending submarine telecommunication cable applications in the North Atlantic. If the cable routes enter the water quality GAA, short-term disturbance in the form of increased suspended sediment and turbidity would be expected.	See Section 3.21.2.2.2 for analysis.	See Section 3.21.2.3 and Section 3.21.2.1, Table 3.21-1 for analysis.	See Section 3.21.2.1, Table 3.21-1 for analysis.
Port utilization: Expansion	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. Between 1992 and 2012, global shipping traffic also	The general trend along the coastal region from Virginia to Maine is that port activity would increase modestly over the next 35 years. Port modifications and channel-	See Section 3.21.2.2.2 for analysis.	See Section 3.21.2.3 and Section 3.21.2.1, Table 3.21-1 for analysis.	See Section 3.21.2.1, Table 3.21-1 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity would increase modestly. The ability of ports to receive the increase in larger ships would require port modifications, which, along with additional vessel traffic, could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and could continue to increase in the foreseeable future.	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 could continue to increase in the foreseeable future.			
Presence of structures	Constructed and permitted OSW COP projects are introducing 17 structures into the GAA. The installation of onshore and offshore structures leads to alteration of local water currents. These disturbances would be local but, depending on the hydrologic conditions, have the potential to impact water quality through the formation of sediment plumes.	Impacts associated with the presence of structures includes temporary sediment disturbance during maintenance. This sediment suspension would lead to interim and localized impacts.	See Section 3.21.2.2.2 for analysis.	See Section 3.21.2.3 and Section 3.21.2.1, Table 3.21-1 for analysis.	See Section 3.21.2.1, Table 3.21-1 for analysis.
Discharges	Constructed and permitted OSW COP projects can potentially generate operational waste, including bilge and ballast water, sanitary and domestic wastes, and trash and debris in the GAA. Discharges impact water quality by introducing nutrients, chemicals, and sediments to the water. There are regulatory requirements related to prevention and control of discharges, the prevention and control of accidental spills, and the prevention and control of nonindigenous species.	Increased coastal development is causing increased nutrient pollution in communities. In addition, ocean disposal activity in the North Atlantic and Mid-Atlantic is expected to gradually decrease or remain stable. Impacts of ocean disposal on water quality are minimized because the EPA has established dredge spoil criteria and regulate the disposal permits issued by the USACE. The impact on water quality from sediment suspension during these future activities would be short term and localized.	See Section 3.21.2.2.2 for analysis.	See Section 3.21.2.3 and Section 3.21.2.1, Table 3.21-1 for analysis.	See Section 3.21.2.1, Table 3.21-1 for analysis.

* Includes two constructed and permitted COP projects that occur within the water quality GAA: Block Island, SFWF.

Coastal Habitats and Fauna

Table E2-1. **Summary of Activities and the Associated Impact-Producing Factors for Coastal Habitats and Fauna**

Associated IPFs: Sub-IPFs	**Ongoing Activities***	**Future Non–Offshore Wind Activities Intensity/Extent**	**Future Offshore Wind Activities Intensity/Extent**	**Proposed Action and Alternatives C through F**	**Alternative G (Preferred Alternative)**
New cable emplacement/ maintenance	Onshore buried transmission cables are present in the area near the Project onshore and offshore improvements. Onshore activities would only occur where permitted by local land use authorities, which would avoid long-term land use conflicts. Continual development of residential, commercial, industrial, solar, transmission, gas pipeline, onshore wind turbine, transportation infrastructure, sewer infrastructure, and cell tower projects could permanently convert various areas.	No known proposed onshore structures are reasonably foreseeable and proposed to be located in the GAA for coastal habitats and fauna.	A small amount of infrequent construction impacts associated with onshore power infrastructure would be required over the next 6 to 10 years to tie future OSW energy projects to the electric grid. Typically, this would require only small, if any, amounts of coastal habitat removal and would likely occur in previously disturbed areas. Habitat loss occurs when an area supporting wildlife is converted to non-habitat that lacks the natural resources to support occupancy for any species, such as paved areas. Short-term and temporary impacts associated with habitat loss or avoidance during construction could occur, and injury or mortality of individuals could occur. For this reason, land disturbance associated with onshore construction activities would have a **negligible** contribution to overall adverse impacts on coastal habitats and fauna.	**Onshore**: During construction of the onshore transmission cable and associated activities within the landfall work area, land disturbance could result in small temporary impacts (e.g., displacement and potential injury and/or mortality of individuals) on coastal fauna. Land disturbance and subsequent habitat removal or alteration could result from the RWEC connection to the landfall work area and construction of the onshore transmission cable. Potential indirect impacts to coastal habitats would include the spread of invasive species, reduction in habitat quality, and displacement of wildlife and resources based on changes to habitat conditions. The potential for onshore construction and habitat alteration to significantly affect coastal habitat is limited because the landfall work area consists of areas of predominately human-made shoreline and grassland/shrubland areas as a result of previous human activity. Habitat conversion is not a factor for developed areas (e.g., existing buildings, mowed lawns, parking lots, roads) within the landfall envelope. The construction period for the onshore facilities would occur over approximately 18 months, and the infrastructure at the landfall work area would be placed underground when completed. HDD would be employed to connect the RWEC and the landfall work area. This would limit or completely avoid direct impacts to the human-made shoreline and ruderal grassland/shrubland because the RWEC would be installed under these resources. The temporary onshore construction work area for the HDD operations would likely be situated within a previously developed area (e.g., an existing parking lot) and would not impact the human-made shoreline and/or the ruderal grassland/shrubland. However, if these habitat types are disturbed, these impacts would be short term because the area would be reseeded to re-establish previous conditions. The human-made shoreline does not support	Similar impacts to the Proposed Action and Alternatives C through F. Therefore, construction and installation, O&M, and cumulative impacts would be **negligible** adverse.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				any vegetative growth. A potential indirect impact to coastal habitat from onshore construction and habitat alteration linked to construction of the landfall work area is habitat degradation via the spread of invasive species. If vegetative clearing is required within the ruderal grassland/shrubland for construction of the landfall work area, then this could provide an opportunity for invasive plant species to outcompete native plants. The baseline conditions of the ruderal grassland/shrubland habitat already support a high occurrence of invasive plant species. Habitats with high levels of invasive species can degrade habitat quality for wildlife by reducing the amount of native plant material available for foraging. However, this area of undisturbed habitat is so small it is unlikely to provide a significant habitat resource to wildlife. The spread of invasive species would be managed in compliance with state and federal regulations. Impacts to coastal habitats and fauna from construction activities at the landfall work area would be considered short-term **negligible** adverse for the Proposed Action and Alternatives C through F. As noted within the landfall work area impact assessment, wildlife species subject to direct mortality during construction of the onshore facilities are those with limited or no mobility. Onshore transmission cable installation would result in temporary ground disturbance, but permanent disturbances are not anticipated. Most of the temporary ground disturbance would be from a trench that would follow along paved roads or previously disturbed areas (e.g., parking lots) except for a small portion that intersects approximately 0.02 acre of plantation and ruderal forest. The onshore transmission cable would be up to 1 mile long with a maximum temporary disturbance corridor of 25 feet (30 feet at splice vaults) and a maximum disturbance depth of 10 feet that would be mostly limited to established road ROWs or previously disturbed areas such as parking lots with little to no impact to adjacent coastal and terrestrial habitat. Where the onshore transmission cable would connect to the OnSS, it would be	

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				installed below a proposed access driveway. Some of the alternative routes under consideration within the transmission cable envelope contain segments that would pass through undeveloped, vegetated areas. If selected, these routes would require vegetative clearing and would be maintained as managed lawn and or gravel access road to maintain access to the cable infrastructure belowground. Since these segments of the onshore transmission cable routes under consideration would be installed within previously undeveloped areas, the impacts resulting from habitat alteration and conversion would be considered long term and **negligible**. Regular O&M activities would not cause further habitat alteration or impact coastal habitats and fauna. However, when cable inspection or repairs require excavation, this nonroutine maintenance could cause limited land disturbance to create access to the infrastructure. Such occurrences are expected to be infrequent and would result in localized and short-term **negligible** adverse impacts to coastal habitats and fauna for the Proposed Action and Alternatives C through F. Decommissioning of the onshore transmission cable would have similar impacts on coastal habitats and fauna to those described for the construction phase if the underground infrastructure is removed. If the infrastructure is abandoned in place, it would not have any impacts. Construction and installation, O&M, and decommissioning of the onshore transmission cable under all Project alternatives would incrementally contribute to the habitat conversion and habitat loss described under the No Action Alternative. Because of the small amount of affected onshore habitat, land disturbance from the Proposed Action and Alternatives C through F when added to other past, present, and reasonably foreseeable projects would result in **negligible** adverse incremental impacts to coastal habitats and fauna.	

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Presence of structures	Periodic clearing of shrubs and tree saplings along existing utility ROWs causes disturbance and temporary displacement of mobile species and could cause direct injury or mortality of less mobile species, resulting in short-term impacts that are less than noticeable. Continual development of residential, commercial, industrial, solar, transmission, gas pipeline, onshore wind turbine, and cell tower projects also causes disturbance, displacement, and potential injury and/or mortality of fauna, resulting in small temporary impacts.	No future activities were identified within the GAA other than ongoing activities.	See Section 3.8.2.2.2 for analysis.	See Section 3.8.2.3 and Section 3.8.2.1, Table 3.8-2 for analysis of onshore impacts. The IPF would not impact offshore resources.	See Section 3.8.2.1, Table 3.8-2 for analysis of onshore impacts. The IPF would not impact offshore resources.
Noise: Onshore/offshore construction	Ongoing noise from construction occurs frequently near shores of populated areas in New England and the Mid-Atlantic region but infrequently offshore. Noise from construction near shorelines is expected to gradually increase over the next 30 years, in line with human population growth along the coast of the GAA. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary.	No future activities were identified within the GAA other than ongoing activities.	Onshore construction noise has the potential to have a **negligible** adverse impact on coastal fauna. BOEM anticipates that these impacts would be temporary and highly localized. Habitat-related impacts (i.e., displacement from potentially suitable habitats) could occur as a result of construction activities. These impacts would likely be limited to temporary behavioral avoidance, and no permanent impacts would be expected. Given the temporary and localized nature of potential impacts, and the current level of development within the GAA, no individual fitness or population-level impacts would occur as a result of noise associated with onshore construction activities.	**Onshore:** Another potential indirect impact to coastal fauna during construction of the onshore facilities is displacement or avoidance behavior of individuals due to noise. The overall installation schedule for onshore facilities is expected to be approximately 1 year (see COP Section 3.2, Project Schedule). Construction would typically result in temporary increases in noise. As described in VHB's onshore acoustic assessment (VHB 2023a), noise was evaluated based generally on the noisiest condition when the loudest construction equipment would be in operation. The primary noise sources generated during construction would be from increased traffic volumes (i.e., delivery trucks carrying construction equipment and supplies and automobiles used for daily commuting to various work sites) and HDD at the landfall work area. Sound-generating construction equipment associated with HDD operations would include a drill rig, a generator, and mud pumps. Unlike most other construction activities that can be limited to daytime hours, it is typically necessary for HDD operations to occur continuously to minimize the risk of soil settlement and equipment failures. Other noise-generating equipment used during HDD operations would include an excavator, a crane, and either an impact or vibratory sheet pile driver for site preparation. The onshore acoustic assessment (VHB 2023a) indicates that construction equipment used to support construction of the landfall work area could create sound levels that range from 56 to 101 dBA at 50 feet from the noise source. Ambient	Similar impacts to the Proposed Action and Alternatives C through F. Therefore, construction and installation, O&M, and cumulative impacts would be **negligible** adverse.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				sound measurements conducted within the GAA under existing conditions ranged from 44 to 45 dBA (Leq) at night and 49 to 50 dBA during the day (VHB 2023a). Construction of the onshore transmission cable would involve different construction phases, each using noise-generating equipment such as bulldozers, backhoes, front-end loaders, aerial lifts, trenchers, compactors, concrete saws, graders, pumps, compressors, and trucks. Because the onshore transmission cable installation process would progress along the cable route during this period, the exposure to construction noise would be limited to a discrete duration at any location along the route. The onshore acoustic assessment (VHB 2023a) indicates that construction equipment used to support construction of the onshore transmission cable could create sound levels that range from 73 to 90 dBA at 50 feet from the noise source depending on the installation methodology. The sequence for construction of the OnSS and ICF would typically include clearing the site of vegetation, grading the site, installing environmental erosion controls, installing the foundations and erecting buildings for housing equipment, and restoring any disturbed areas on the site and removing environmental controls. The types of construction equipment used would generally include backhoes, cranes, refrigerator units, front-end loaders, and generators. The onshore acoustic assessment (VHB 2023a) indicates that construction equipment used to support construction of the OnSS could create sound levels that range from 80 to 85 dBA at 50 feet from the noise source. Potential impacts to coastal fauna from the temporary increase in construction-generated noise could include avoidance behavior and displacement during the construction period (Brown et al. 2012). Because the construction period is temporary, noise impacts on wildlife species during construction of the onshore facilities of the Proposed Action and Alternatives C through F are expected to be temporary **negligible** adverse. No impacts related to noise would be expected from operation of the onshore transmission	

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				cable because the infrastructure would be underground. However, when cable inspection or repairs require excavation, this non-routine maintenance could generate equipment- and vehicle-related noise. Such occurrences are expected to be infrequent and would result in localized and short-term **negligible** adverse impacts to coastal habitats and fauna. Decommissioning of the onshore transmission cable would have similar impacts from noise on coastal habitats and fauna to those described for the construction phase if the underground infrastructure is removed. If the infrastructure is abandoned in place, it would not have any impacts. O&M at the proposed OnSS and ICF would introduce new sources of sound, including transformers, shunt reactors, harmonic filters, cooling and ventilation associated with the outdoor substation equipment as well as condensers, pumps, skids, and auxiliary transformers associated with the synchronous condenser building. Operational sound from the OnSS and ICF is modeled to be 45.5 dBA (Leq) or less when measured at the nearest anthropogenic noise sensitive receivers, which would fall within the ambient sound range measured at baseline conditions (44 to 45 dBA (Leq) at night and 49 to 50 dBA during the day) (VHB 2023a), and no impacts to coastal fauna are expected. Temporary noise could occasionally be generated during non-routine maintenance at all onshore facilities. Infrequent vehicle usage within the OnSS and ICF could create temporary disturbance to wildlife adjacent to the OnSS, but such disturbance would be short term, and normal wildlife activity would likely resume after the traffic ceases. Impacts from noise during decommissioning of onshore facilities would be similar to those during construction: temporary **negligible** adverse for all Project alternatives. Construction, O&M, and decommissioning of the onshore facilities would also produce temporary noise that would lead to short-term negligible incremental impacts, if any, on coastal habitats and fauna. The onshore elements of the Proposed Action and	

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				Alternatives C through F would be in already developed areas with existing noise disturbance where wildlife is habituated to human activity. Therefore, the cumulative impact of noise generated by the Proposed Action and Alternatives C through F on coastal habitats and fauna when combined with past, present, and reasonably foreseeable projects would be localized and short term **negligible** adverse.	
Climate change: Warming and sea level rise, altered habitat/ecology	Climate change, influenced in part by GHG emissions, is altering the seasonal timing and patterns of species distributions and ecological relationships, likely causing permanent changes of unknown intensity gradually over the next 35 years.	No future activities were identified within the GAA other than ongoing activities.	See Section 3.8.2.2.2 for analysis.	See Section 3.8.2.3 and Section 3.8.2.1, Table 3.8-2 for analysis of onshore impacts. The IPF would not impact offshore resources.	See Section 3.8.2.1, Table 3.8-2 for analysis of onshore impacts. The IPF would not impact offshore resources.

* No constructed and permitted COP projects occur within the coastal habitats and fauna GAA.

Wetlands and Non-tidal Waters

Table E2-2. Summary of Activities and the Associated Impact-Producing Factors for Wetlands and Non-tidal Waters

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Fuel/fluids/ hazmat	Ongoing onshore construction projects that involve vehicles and equipment that use fuel, fluids, or hazardous materials could result in an accidental release. Intensity and extent would vary, depending on the size, location, and materials involved in the release.	No future activities were identified within the GAA for wetlands and non-tidal waters other than ongoing activities.	See Section 3.22.2.2.2 for analysis.	See Section 3.22.2.3 and Section 3.22.2.1, Table 3.22-2 for analysis of onshore impacts. The IPF would not impact offshore resources.	See Section 3.22.2.1, Table 3.22-2 for analysis of onshore impacts. The IPF would not impact offshore resources.
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 cable, line, and pipeline laying.	No future activities were identified within the GAA for wetlands and non-tidal waters other than ongoing activities.	See Section 3.22.2.2.2 for analysis.	See Section 3.22.2.3 and Section 3.22.2.1, Table 3.22-2 for analysis of onshore impacts. The IPF would not impact offshore resources.	See Section 3.22.2.1, Table 3.22-2 for analysis of onshore impacts. The IPF would not impact offshore resources.
Discharges	Discharges impact water quality by introducing nutrients, chemicals, and sediments to the water. There are regulatory requirements related to the prevention and control of discharges, the prevention and control of accidental spills, and the prevention and control of nonindigenous species.	Increased future coastal development has the potential to cause increased nutrient pollution in communities, approximately 80% of which is due to groundwater contamination by septic systems. In addition, ocean disposal activity in the North Atlantic is expected to gradually decrease or remain stable. Impacts of ocean disposal on water quality are minimized because the EPA has	See Section 3.22.2.2.2 for analysis.	See Section 3.22.2.3 and Section 3.22.2.1, Table 3.22-2 for analysis of onshore impacts. The IPF would not impact offshore resources.	See Section 3.22.2.1, Table 3.22-2 for analysis of onshore impacts. The IPF would not impact offshore resources.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
		established dredge spoil criteria and regulates the disposal permits issued by the USACE.			
New cable emplacement/ maintenance	No known proposed cables are reasonably foreseeable and proposed to be located in the GAA for wetlands and non-tidal waters.	Any new cable or pipeline installed in the GAA would likely require hard protection atop portions of the route. Such protection is anticipated to increase incrementally over the next 30 years.	See Section 3.22.2.2.2 for analysis.	See Section 3.22.2.3 and Section 3.22.2.1, Table 3.22-2 for analysis of onshore impacts. The IPF would not impact offshore resources.	See Section 3.22.2.1, Table 3.22-2 for analysis of onshore impacts. The IPF would not impact offshore resources.
Presence of structures	Ongoing development of onshore properties, especially shoreline parcels, periodically could 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. No known proposed structures are reasonably foreseeable and proposed to be located in the GAA for wetlands and non-tidal waters.	Impacts associated with the presence of structures includes temporary sediment disturbance during maintenance and ongoing development. This sediment suspension would lead to short-term and localized impacts.	See Section 3.22.2.2.2 for analysis.	See Section 3.22.2.3 and Section 3.22.2.1, Table 3.22-2 for analysis of onshore impacts. The IPF would not impact offshore resources.	See Section 3.22.2.1, Table 3.22-2 for analysis of onshore impacts. The IPF would not impact offshore resources.
Sediment deposition and burial	Ongoing cable or structure maintenance activities can infrequently disturb sediments; these disturbances are local and limited to the emplacement corridor. Precipitation events could potentially mobilize the disturbed sediments into nearby surface waters, leading to potential erosion and sedimentation effects and subsequent increased turbidity.	No future activities were identified within the GAA other than ongoing activities.	Dredge materials from future OSW activities would not be disposed of in areas with wetlands or other WOTUS within the GAA. Therefore, **negligible** adverse impacts to wetlands and non-tidal waters within the GAA are anticipated.	Dredged materials from Project activities would not be disposed of in areas with wetlands or other WOTUS. Therefore, sediment deposition and burial impacts on wetlands and non-tidal waters from construction and installation would be the same for the Proposed Action and Alternatives C through F: **negligible** adverse. O&M of onshore O&M facilities could include dredging activities for the Proposed Action and Alternatives C through F; however, materials from O&M activities would not be disposed of in areas with wetlands or other WOTUS. Therefore, **negligible** adverse impacts to wetlands and non-tidal waters from sediment deposition and burial are anticipated for all Project alternatives. Dredge materials from the Proposed Action and Alternatives C through F and other future OSW projects within the GAA would not be disposed of in areas with wetlands or other WOTUS. As a result, when combined with past, present, and reasonably foreseeable projects, the Proposed Action and Alternatives C through F are expected to result in **negligible** adverse impacts to wetlands and non-tidal waters.	Similar impacts to the Proposed Action and Alternatives C through F. Therefore, construction and installation impacts would be short term **negligible** adverse. O&M impacts to wetlands and non-tidal waters are anticipated to be **negligible** adverse. When combined with past, present, and reasonably foreseeable projects, Alternative G is expected to result in **negligible** adverse impacts to wetlands and non-tidal waters.
Climate change: Warming and sea	Climate change, influenced in part by ongoing GHG emissions, is expected to continue to	No future activities were identified within the GAA other than ongoing activities.	Impacts of climate change, including increased storm severity and frequency, are	Air pollutants could impact onshore biological resources, including wetlands and WOTUS.	Similar impacts to the Proposed Action and Alternatives C through F. Therefore,

Associated IPFs: Sub-IPFs	**Ongoing Activities***	**Future Non–Offshore Wind Activities Intensity/Extent**	**Future Offshore Wind Activities Intensity/Extent**	**Proposed Action and Alternatives C through F**	**Alternative G (Preferred Alternative)**
level rise, altered habitat/ecology	contribute to a widespread loss of shoreline habitat from rising seas and erosion. In submerged habitats, warming is altering ecological relationships and the distributions of ecosystem engineer species, likely causing permanent changes of unknown intensity gradually over the next 3 years.		ongoing stressors for wetlands and non-tidal waters. Future OSW projects aim to combat climate change and associated effects by reducing GHG emissions. Under the No Action Alternative, the long-term net decrease in GHG emissions from other ongoing and future OSW and other non-fossil fuel–based energy generation projects would be slightly less than with the Proposed Action. As a result, the effects to wetlands and non-tidal waters would be **negligible** to **minor** adverse, as they are anticipated to occur but have no measurable influence within the GAA.	Acidification of soils, lakes, and streams could result in changes in community structure and biodiversity within these habitats. The OCS air permitting process will require air dispersion modeling of these emissions to demonstrate compliance with the NAAQS. Specifically, EPA requires modeling of NAAQS and Class I significant impact levels for the purpose of PSD permitting for the construction and operation of Revolution Wind. Compliance with the NAAQS offshore in and near the Lease Area will be evaluated with air quality dispersion modeling through EPAs OCS permitting. Because air emissions generated during the construction and installation period would not exceed applicable air emission standards the impacts to onshore wetlands and non-tidal waters would be short-term **negligible** adverse. While cumulative air emissions in the region would increase during construction, it is important to note that the Proposed Action could also contribute to a long-term net decrease in emissions by substituting some existing fossil fuel sources with a renewable source. Therefore, impacts to wetlands and non-tidal waters are anticipated to be **negligible** adverse. The cumulative impacts from global climate change would be the same as those described for future OSW activities without the Proposed Action because emissions from other past, present, and reasonably foreseeable projects, in combination with air emissions generated during construction and O&M would not exceed applicable air emission standards. Thus, potential impacts to wetlands and non-tidal waters from the incremental contribution to climate change attributed to the Proposed Action when combined with past, present, and other reasonably foreseeable projects are uncertain but are anticipated to qualify as long term **negligible** adverse. Alternatives C through F would have the same onshore activities and facilities as the Proposed Action; therefore, climate change impacts on wetlands and non-tidal waters	construction and installation impacts would be short term **negligible** adverse. O&M impacts to wetlands and non-tidal waters are anticipated to be **negligible** adverse. Potential impacts to wetlands and non-tidal waters from the incremental contribution to climate change attributed to the Proposed Action when combined with past, present, and other reasonably foreseeable projects are uncertain but are anticipated to qualify as long term **negligible** adverse.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				would be the same as those described for the Proposed Action: **negligible** adverse.	

* No constructed and permitted COP projects occur within the wetlands and non-tidal waters GAA.

Benthic Habitat and Invertebrates

Table E2-3. Summary of Activities and the Associated Impact-Producing Factors for Benthic Habitat and Invertebrates

Associated IPFs: Sub-IFPs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Fuel/fluids/ hazmat	Constructed and permitted OSW COP projects can accidentally release an estimated 900,000 gallons of fuel, oils, or other hazardous materials into the invertebrates GAA. See Table E1-4 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 nontoxic levels before they affect benthic resources. The corresponding impacts on benthic resources are rarely noticeable. Impacts, including mortality and decreased fitness, are localized and temporary and rarely affect invertebrate populations. All vessels would comply with USCG requirements and BSEE regulations for the prevention and control of oil and fuel spills.	Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases. Impacts are unlikely to affect invertebrate populations.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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 GAA other than ongoing activities.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Accidental releases: Trash and debris	Constructed and permitted OSW COP projects can potentially generate operational waste, including bilge and ballast water, sanitary and domestic wastes, and trash and debris into the invertebrates GAA. Other ongoing releases of trash and debris occurs from onshore sources; fisheries use; dredged	No future activities were identified within the GAA other than ongoing activities.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on

Associated IPFs: Sub-IFPs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	material ocean disposal; marine minerals extraction; marine transportation; navigation and traffic; survey activities; and cable, line, and pipeline laying. However, there does not appear to be evidence that ongoing releases have detectable impacts on benthic resources. All vessels would adhere to federal, state, and local regulations regarding disposal of solid and liquid wastes.			effect on benthic habitat or invertebrates and are not analyzed.	benthic habitat or invertebrates and are not analyzed.
Anchoring	Constructed and permitted OSW COP projects are introducing an estimated 944 acres of anchoring in the invertebrates GAA. This, combined with regular vessel anchoring related to other ongoing military, survey, commercial, and recreational activities, continues 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. These impacts are greatest for sessile or slow-moving species (e.g., corals, sponges, and sedentary shellfish). 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 habitat.	No future activities were identified within the GAA other than ongoing activities.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Bycatch	Bycatch occurs in various gillnet and trawl fisheries in New England and the Mid-Atlantic Coast, with hotspots driven by fishing intensity (Lewison et al. 2014; NMFS 2018a).	No future activities were identified within the GAA for this resource other than ongoing activities.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
EMFs	Constructed and permitted OSW COP projects can generate EMF and substrate heating effects, altering the environment for benthic invertebrates and other organisms associated with those habitats. EMFs also continuously emanate from existing telecommunication and electrical power transmission cables. New cables generating EMFs are infrequently installed in	No future activities were identified within the GAA other than ongoing activities.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.

Associated IPFs: Sub-IFPs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	the GAA. 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 m) from the cable and the intensity of impacts on benthic resources is likely undetectable.				
Light: Vessels	Nighttime vessel activity associated with permitted and built OSW COP projects is occurring during installation and O&M of various project components (cables, substation etc.). 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 invertebrates, potentially affecting distributions in a highly localized area. Light could also disrupt natural cycles (e.g., spawning), possibly leading to short-term impacts.	See table cell to the left.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Light: Structures	Constructed and permitted OSW COP projects are introducing 83 lighted structures into the invertebrate GAA. 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 invertebrates, potentially affecting distributions in a highly localized area. Light could 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.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
New cable emplacement/ maintenance	Constructed and permitted OSW COP projects are introducing an estimated 498 miles of new offshore cable in the GAA. This and other non-OSW cable maintenance activities infrequently disturb benthic resources and cause temporary increases in suspended sediment; these disturbances would be local 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)	Future new cables would occasionally disturb the seafloor and cause temporary increases in suspended sediment, resulting in local short-term impacts. The FCC has two pending submarine telecommunication cable applications in the North Atlantic. If the cable routes enter the GAA 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.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.

Associated IPFs: Sub-IFPs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	where the activities occur. (See also the IPFs of seafloor profile alterations and sediment deposition and burial.)				
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 benthic habitat and invertebrates, 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 benthic habitat and invertebrates.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Noise: Onshore/offshore construction	Noise from onshore construction associated with permitted OSW COP projects is occurring during installation of various project components (cables, substation etc.). Other noise from construction occurs frequently in the nearshores of populated areas in New England and the Mid-Atlantic region but infrequently offshore. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary. Detectable impacts of construction noise on benthic resources rarely, if ever, overlap from multiple sources. See also sub-IPF for Noise: Pile driving.	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the GAA for this resource. Detectable impacts of construction noise on benthic resources would rarely, if ever, overlap from multiple sources.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Noise: G&G	Noise from G&G surveys associated with permitted OSW COP projects may occur in the invertebrate GAA. Ongoing site characterization surveys and scientific surveys produce noise around sites of investigation. These activities can disturb 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. Detectable impacts of G&G noise on benthic resources rarely, if ever, overlap from multiple sources.	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 seafloor, potentially resulting in injury or mortality to 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 local and temporary. Detectable impacts of G&G noise on benthic resources would rarely, if ever, overlap from multiple sources.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Noise: O&M	Noise from O&M associated with built OSW COP projects may occur in the invertebrate	New or expanded marine minerals extraction and commercial fisheries could intermittently	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore

Associated IPFs: Sub-IFPs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	GAA. Some invertebrates could be able to hear the continuous underwater noise of operational WTGs. As measured at the BIWF, this low-frequency noise barely exceeds ambient levels at 164 feet (50 m) from the WTG base. Based on the results of Thomsen et al. (2015), sound pressure levels would be expected to be at or below ambient levels at relatively short distances (approximately 164 feet [50 m]) 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 local impacts.	increase noise during their O&M over the next 35 years. Impacts would likely be small and local.	activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Noise: Pile driving	Noise from pile driving associated with permitted OSW COP projects is occurring during installation of foundations for offshore structures. Noise from pile driving also occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seafloor can cause injury and/or mortality to benthic resources 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 invertebrates could also experience developmental abnormalities or mortality resulting from this noise, although thresholds of exposure are not known (Hawkins and Popper 2017; Weilgart 2018). The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the GAA other than ongoing activities.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Noise: Cable laying/trenching	Noise from trenching/cable laying associated with permitted OSW COP projects may occur in the invertebrates GAA. Infrequent trenching activities for other pipeline and cable laying, as well as other cable burial methods, also emit noise. These disturbances are local, temporary, 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 GAA. These disturbances would be infrequent over the next 35 years, local, temporary, 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.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Port utilization: Expansion	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing 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 and cruise industry) and could continue to increase in the foreseeable future. In addition, the general trend along the coast from Virginia to Maine is that port activity would increase modestly. The ability of ports to receive the increase could require port modifications, leading to local impacts. Future channel-deepening activities would likely be undertaken. Existing ports have already affected benthic resources and invertebrates, and future port projects would implement BMPs to minimize impacts. Although the degree of impacts would likely be undetectable outside the immediate vicinity of the ports, adverse impacts for certain species and/or life stages could lead to impacts on benthic resources and invertebrates beyond the vicinity of the port.	**Offshore:** The development of an OSW industry on the Mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Activities like dredging and the expansion or development of new overwater structures could lead to adverse effects on coastal and estuarine benthic habitats and invertebrates or benthic resources. However, any such impacts would be outside the GAA for benthic habitat and the nature and extent of these impacts on invertebrates cannot currently be quantified as no specific port improvement activities have been proposed. Therefore, these activities would have a **negligible** adverse impact on benthic resources and invertebrates. Any future port expansion would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential environmental effects.	**Offshore:** Several regional ports could be used during Project construction and decommissioning, including ports in Baltimore, MD; New Bedford, MA; New London, CT; Norfolk, VA; Paulsboro, NJ; and Providence, RI, as well as Europe. The development of an OSW industry on the Mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Port improvements could include activities like dredging and the development of new overwater structures that could adversely affect benthic resources or invertebrates within the GAA, but no specific improvements are included in the Proposed Action and Alternatives C through F. Any future port expansion incentivized by the Project would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential environmental effects. Therefore, these localized and cumulative habitat impacts would have **a negligible** adverse effect on benthic habitats or marine invertebrates during Project construction, O&M, and decommissioning.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, these localized and cumulative habitat impacts would have **a negligible** adverse effect on benthic habitats or marine invertebrates during Project construction, O&M, and decommissioning.
Presence of structures: Entanglement, gear loss, gear damage	Constructed and permitted OSW COP projects are introducing 83 structures into the invertebrates GAA. Additionally, 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).	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Presence of structures: Hydrodynamic disturbance	Constructed and permitted OSW COP projects are introducing 83 structures into the invertebrates GAA. 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 benthic resources and invertebrates are typically undetectable. Indirect impacts of structures influencing primary productivity and higher trophic levels	Tall vertical structures can increase seafloor 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.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.

Associated IPFs: Sub-IFPs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	are possible but are not well understood. New structures are periodically added.				
Presence of structures: Fish aggregation	Constructed and permitted OSW COP projects are introducing 83 structures into the invertebrates GAA. 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 local and permanent.	New cables installed in the GAA over the next 35 years would likely require hard protection atop portions of the route (see the New cable emplacement/maintenance row in this table). Any new towers, buoys, or piers would also create uncommon relief in a mostly flat, sandy seascape. Structure-oriented fishes could be attracted to these locations. Increased predation upon benthic resources by structure-oriented fishes could adversely affect populations and communities of benthic resources. These impacts are expected to be local and permanent as long as the structures remain.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Presence of structures: Habitat conversion	Constructed and permitted OSW COP projects are introducing 83 structures into the invertebrates GAA. 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 and/or complex habitat. Benthic species dependent on hard-bottom habitat and structure-oriented species thus benefit on a constant basis; however, the diversity could decline over time as early colonizers are replaced by successional communities dominated by blue mussels and anemones (Degraer et al. 2019: Chapter 7) and 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.	Any new towers, buoy, 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), and the diversity could 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 in the region, and species that rely on this habitat would not likely experience population-level impacts (Greene et al. 2010; Guida et al. 2017).	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Presence of structures: Migration disturbances	Constructed and permitted OSW COP projects are introducing 83 structures into the invertebrates GAA. Human structures in the marine environment (e.g., shipwrecks, artificial reefs, and oil platforms) can attract invertebrates that approach the structures during their migrations. To date, BOEM has not identified any published evidence to suggest that human structures pose a barrier to, or slow, migratory invertebrates.	The infrequent installation of future new structures in the marine environment over the next 35 years could attract invertebrates that approach the structures during their migrations. This could slow migrations. Migratory animals would likely be able to proceed from structures unimpeded.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Presence of structures: Transmission cable infrastructure	Constructed and permitted OSW COP projects are introducing an estimated 498 miles of new offshore cable in the invertebrates GAA. The presence of transmission 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 rows.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Discharges	Constructed and permitted OSW COP projects can potentially generate operational waste, including bilge and ballast water, sanitary and domestic wastes, and trash and debris in the invertebrates GAA. 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 to benthic resources are short term because spoils are typically recolonized naturally. In addition, the EPA has established dredge spoil criteria and it regulates the disposal permits issued by the USACE; these discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Sediment deposition and burial	Ongoing sediment dredging for navigation purposes and installation of permitted OSW COP projects can result in fine sediment deposition. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local 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—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 could vary based on season/time of year. Where dredged materials are disposed, benthic resources are smothered. However, such areas are typically recolonized naturally in the short term. Most sediment dredging projects have time-of-year restrictions to minimize impacts on benthic resources. Most benthic resources in the GAA are adapted to the turbidity and periodic sediment deposition that occur naturally in the GAA.	The USACE and/or private ports could 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 GAA are adapted to the turbidity and periodic sediment deposition that occur naturally in the GAA.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7, and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Vessel traffic	While ongoing OSW and non-OSW vessel activity could 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.	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 30 years. Even with increased port visits by deep draft vessels, this is still a relatively small adjustment when considering the whole of New England vessel traffic.	**Offshore:** Construction and operational vessel traffic from future wind farm development and decommissioning would not be expected to measurably affect marine invertebrates and benthic habitat structure and composition. Although construction and O&M of vessel cooling systems could entrain planktonic eggs and larvae of fish and invertebrates, leading to injury or mortality of some individuals, these effects are not expected to be measurable relative to natural mortality rates, which can range from 1 to 10% per day or higher (White et al. 2014). Therefore, these effects are unlikely to be significant at the population level. Vessel traffic would have no measurable effects on benthic habitat and benthic or pelagic invertebrates aside from underwater noise exposure and vessel anchoring, which are addressed separately above. Therefore, vessel traffic effects on benthic habitat and invertebrates from the construction, O&M, and decommissioning of planned and potential future OSW energy projects would be **negligible** adverse relative to baseline conditions in the affected environment.	**Offshore:** Construction, O&M, and decommissioning of vessel cooling systems could entrain planktonic eggs and larvae of fish and invertebrates, leading to injury or mortality of individuals. However, these short-term effects are not expected to be measurable relative to natural mortality rates and are therefore unlikely to be significant at the population level. Therefore, vessel traffic effects on invertebrates and benthic habitat would be **negligible** adverse for all Project alternatives and configurations. Although Alternatives C through F would decrease the total number of vessel trips and duration of vessel activity required for O&M and decommissioning relative to the Proposed Action, impacts would remain **negligible** adverse for all Project alternatives. The construction and O&M of all Project alternatives and other planned and potential future OSW energy projects would require the use of construction and operational vessels. This would increase the number of vessels operating in the invertebrate GAA for the foreseeable future. However, vessel-related entrainment mortality is unlikely to be significant at the population level for any invertebrate species. Therefore, vessel traffic cumulative effects on benthic habitat and invertebrates in combination with other planned and potential future OSW energy projects would be **negligible** adverse relative to baseline conditions in the affected environment.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, vessel traffic effects on invertebrates and benthic habitat would be **negligible** adverse for all Project alternatives and configurations. Although Alternative G would decrease the total number of vessel trips and duration of vessel activity required for O&M and decommissioning relative to the Proposed Action, impacts would remain **negligible** adverse for all Project alternatives. Vessel traffic cumulative effects on benthic habitat and invertebrates in combination with other planned and potential future OSW energy projects would be **negligible** adverse relative to baseline conditions in the affected environment.
Climate change: Ocean acidification	Ongoing CO_2 emissions causing ocean acidification could contribute to reduced growth or the decline of benthic invertebrates that have calcareous shells, as well as reefs and other habitats formed by shells, over the course of the next 35 years.	No future activities were identified within the GAA other than ongoing activities.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Climate change: Warming and sea level rise, altered habitat, ecology,	Climate change, influenced in part by ongoing GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the distributions of benthic species and altering ecological relationships, likely causing permanent	No future activities were identified within the GAA other than ongoing activities.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no	See Sections 3.6.2.4 through 3.6.2.7 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on

Associated IPFs: Sub-IFPs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
and migration patterns	changes of unknown intensity gradually over the next 35 years.		measurable effect on benthic habitat or invertebrates and are not analyzed.	effect on benthic habitat or invertebrates and are not analyzed.	benthic habitat or invertebrates and are not analyzed.
Climate change: Warming and sea level rise, disease frequency	Climate change, influenced in part by ongoing GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the frequencies of various diseases of benthic species and likely causing permanent changes of unknown intensity over the next 35 years.	No future activities were identified within the GAA other than ongoing activities.	See Sections 3.6.2.2.2 and 3.6.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.4 through 3.6.2.7 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.8 and 3.6.2.9 and Section 3.6.2.1, Table 3.6-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.

* No constructed and permitted COP projects occur within the benthic habitat GAA. Four constructed and permitted COP projects occur within the invertebrates GAA: Block Island, SFWF, Vineyard Wind 1, and Coastal Virginia Offshore Wind.

Finfish and Essential Fish Habitat

Table E2-4. Summary of Activities and the Associated Impact-Producing Factors for Finfish and Essential Fish Habitat

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Fuel/fluids/hazmat	Constructed and permitted OSW COP projects can accidentally release an estimated 900,000 gallons of fuel, oils, or other hazardous materials in the GAA. See Table E1-4 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. All vessels would comply with USCG requirements and BSEE regulations for the prevention and control of oil and fuel spills.	Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases. Impacts are unlikely to affect populations.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Accidental releases: Invasive species	Invasive species are periodically released accidentally during ongoing activities, including the discharge of ballast water and bilge water from marine vessels. The impacts on finfish and EFH depend on many factors, but can be widespread and permanent.	No future activities were identified within the GAA for this resource other than ongoing activities.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Anchoring	Constructed and permitted OSW COP projects are introducing an estimated 944 acres of anchoring in the GAA. This, combined with vessel anchoring related to other ongoing military use and survey, commercial, and recreational activities continues to cause temporary to permanent impacts in the immediate area where anchors and chains meet	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or 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	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	the seafloor. Impacts on finfish and EFH are greatest for sensitive EFH (e.g., eelgrass, hard bottom) and slow-moving species.	habitats. All impacts would be localized; turbidity would be temporary; 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.			would have no measurable effect on finfish or EFH and are not analyzed.
EMFs	Constructed and permitted OSW COP projects can generate EMF and substrate heating effects, altering the environment for finfish and benthic-associated EFH invertebrates. EMFs also emanate continuously from installed telecommunication and electrical power transmission cables. Biologically significant impacts on finfish 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 within the southern New England area (CSA Ocean Sciences, Inc. and Exponent 2019).	During operation, future new cables would produce EMF. (See table cell to the left.) Submarine power cables in the GAA for this resource 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 (even for multiple cables within a single export cable corridor). Although the EMF would exist as long as a cable was in operation, impacts, on finfish and EFH would likely be difficult to detect.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Light: Vessels	Nighttime vessel activity associated with permitted and built OSW COP projects is occurring during installation and O&M of various project components (cables, substation etc.). 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, potentially affecting distributions in a highly localized area. Light could also disrupt natural cycles (e.g., spawning), possibly leading to short-term impacts.	See table cell to the left.	Artificial light can attract finfish and can influence or disrupt biological functions (e.g., timing of cod spawning) (Rich and Longcore 2006) that are triggered by changes in daily and seasonal daylight cycles. Planned future activities include up to 3,088 offshore WTGs and OSS foundations. The construction and O&M of these structures would introduce new short-term and long-term sources of artificial light to the offshore environment in the form of vessel lighting and navigation and safety lighting on the structures, respectively. Orr et al. (2013) developed design and mitigation recommendations for reduction of biologically significant impacts from artificial light in OSW infrastructure. Based on these findings, BOEM (2021) has issued design guidance for avoiding and minimizing artificial lighting impacts from such activities and has concluded that adherence to these measures should effectively avoid adverse effects on fish. BOEM would require all future	**Offshore:** Artificial lighting during construction, O&M, and decommissioning at the RWF would be associated with navigational and deck lighting on vessels from dusk to dawn. Lighting would be hooded and directed downward to avoid unnecessary illumination of the surrounding environment to the extent practicable. Reaction of finfish, including EFH species, to this artificial light is highly species dependent and could include attraction and/or avoidance of the area. Artificial lighting could disrupt the migration patterns of fish, increase risk of predation and disrupt predator prey interactions, and alter species' richness and community composition in the affected area (Nightingale et al. 2006; Orr et al. 2013). However, these types of effects are most associated with bright permanent lights on nearshore and overwater structures. The Project would comply with BOEM (2021) issued design guidance for	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, lighting effects on finfish and EFH would be short term to long term **negligible** adverse for Alternative G, with reduced impacts under Alternatives G due to a decrease in total duration of construction vessel activity. BOEM estimates a cumulative total of up to 3,155 offshore WTGs and OSS foundations for Alternative G plus all other future OSW projects in the finfish and EFH GAA. For reasons described in the preceding paragraph, the cumulative impacts associated with all Project alternatives when combined with past, present, and reasonably foreseeable activities would be **negligible** adverse, mostly attributable to existing, ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
			offshore energy projects to comply with this guidance. Given the minimal and localized nature of anticipated lighting impacts under this guidance, the related effects from proposed future activities on finfish and EFH in the GAA are likely to be **negligible** adverse.	avoiding and minimizing artificial lighting impacts. Therefore, lighting effects on finfish and EFH would be short term to long-term **negligible** adverse for the Proposed Action and Alternatives C through F, with reduced impacts under Alternatives C through F due to a decrease in total duration of construction vessel activity. BOEM estimates a cumulative total of up to 3,183 offshore WTGs and OSS foundations for the Project plus all other future OSW projects in the finfish and EFH GAA. For reasons described in the preceding paragraph, the cumulative impacts associated with all Project alternatives when combined with past, present, and reasonably foreseeable activities would be **negligible** adverse, mostly attributable to existing, ongoing activities.	
Light: Structures	Constructed and permitted OSW COP projects are introducing 83 lighted structures into the GAA. 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, potentially affecting distributions in a highly localized area. Light could 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.	See Light: Vessels for analysis.	See Light: Vessels for analysis of impacts.	See Light: Vessels for analysis of impacts.
New cable emplacement/ maintenance	Constructed and permitted OSW COP projects are introducing an estimated 498 miles of new offshore cable in the GAA. This and other non-OSW cable maintenance activities can disturb the seafloor and cause temporary increases in suspended sediment; these disturbances are local and limited to the cable corridor. New cables are infrequently added near shore. Cable emplacement/maintenance activities disturb, displace, and injure finfish 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 local short-term impacts. The FCC has two pending submarine telecommunications cable applications in the North Atlantic. If the cable routes enter the GAA 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.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Noise: Aircraft	Noise from aircraft reaches the sea surface on a regular basis. However, aircraft noise is not	Aircraft noise is likely to continue to increase as commercial air traffic increases. However,	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	likely to impact finfish and EFH, as very little of the aircraft noise propagates through the water.	aircraft noise is not likely to impact aircraft noise on finfish and EFH.	activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Noise: Onshore/Offshore construction	Noise from onshore construction associated with permitted OSW COP projects is occurring during installation of various project components (cables, substation etc.). Other noise from construction occurs frequently in nearshores of populated areas in New England and the Mid-Atlantic region but infrequently offshore. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary. See also sub-IPF for Noise: Pile driving.	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the GAA for this resource.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Noise: G&G and scientific surveys	Noise from G&G and scientific surveys associated with permitted OSW COP projects may occur in the GAA. Ongoing site characterization surveys and scientific surveys produce noise around sites of investigation. These activities can disturb finfish 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 seafloor, potentially resulting in injury or mortality to finfish 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 local and temporary.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Noise: O&M	Noise from O&M associated with built OSW COP projects may occur in the GAA. Some finfish and invertebrates could be able to hear the continuous underwater noise of operational WTGs. As measured at the BIWF, this low frequency noise barley exceeds ambient levels at 164 feet (50 m) from the WTG base. Based on the results of Thomsen et al. (2015), sound pressure levels would be expected to be at or below ambient levels at relatively short distances (approximately 164 feet [50 m]) from WTG foundations. These low levels of elevated noise likely have little to no impact.	New or expanded marine minerals extraction and commercial fisheries could intermittently increase noise during their O&M over the next 35 years. Impacts would likely be small and local.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	Noise is also created by O&M of marine minerals extraction and commercial fisheries, each of which has small local impacts.				
Noise: Pile driving	Noise from pile driving associated with permitted OSW COP projects is occurring during installation of foundations for offshore structures. Noise from pile driving also occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or the seafloor can cause injury and/or mortality to finfish 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 (Hawkins and Popper 2017; Weilgart 2018). 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 GAA for this resource other than ongoing activities.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Noise: Cable laying/ trenching	Noise from trenching/cable laying associated with permitted OSW COP projects may occur in the GAA. Infrequent trenching activities for other pipeline and cable laying, as well as other cable burial methods, also emit noise. These disturbances are temporary, local, 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 GAA for this resource. These disturbances would be infrequent over the next 35 years, temporary, local, 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.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Noise: Vessels	While ongoing OSW and non-OSW vessel noise could have some effect on behavior and masking, it is likely limited to brief startle and temporary stress responses. Ongoing activities that contribute to this sub-IPF include permitted and construction OSW COP projects, commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	See table cell to the left.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Port utilization: Expansion	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is	The development of an OSW industry on the Mid-Atlantic OCS could incentivize the expansion or improvement of regional ports	**Offshore:** Several regional ports could be used during Project construction, including ports in Baltimore, MD; New Bedford, MA;	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, Project-specific

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 35 years.	expected to continue as human population increases. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and could continue to increase in the foreseeable future. In addition, the general trend along the coast from Virginia to Maine is that port activity would increase modestly. The ability of ports to receive the increase could require port modifications, leading to local impacts. Future channel-deepening activities would likely be undertaken. Existing ports have already affected finfish and EFH, and future port projects would implement BMPs to minimize impacts. Although the degree of impacts on EFH would likely be undetectable outside the immediate vicinity of the ports, adverse impacts on EFH for certain species and/or life stages could lead to impacts on finfish and EFH beyond the vicinity of the port.	to support planned and future projects. Activities like dredging and the expansion or development of new overwater structures could lead to adverse effects on finfish, including EFH species, and coastal and estuarine habitats. Resulting effects on finfish would vary depending on the types of species and habitats present. However, the nature and extent of these impacts cannot currently be quantified as no specific port improvement activities have been proposed. All future port improvements would be subject to independent environmental permitting and regulatory review. Any resulting effects on finfish would be evaluated as part of those efforts. Therefore, impacts to finfish and EFH would be **negligible** adverse.	New London, CT; Norfolk, VA; Paulsboro, NJ; and Providence, RI, as well as Europe. The development of an OSW industry on the Mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Port improvements could include activities like dredging and the development of new overwater structures that could adversely affect finfish and EFH within the GAA, but no specific improvements are included in the Proposed Action and Alternatives C through F. Any future port expansion would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential environmental effects. Therefore, Project-specific and cumulative port utilization impacts would be **negligible** adverse.	and cumulative port utilization impacts would be **negligible** adverse.
Presence of structures: Entanglement, gear loss, gear damage	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. 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- to long-term impacts.	No future activities were identified within the GAA for this resource other than ongoing activities.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Presence of structures: Hydrodynamic disturbance	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. 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 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 seafloor 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.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Presence of structures: Fish aggregation	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables, create uncommon relief in a mostly sandy seascape.	New cables, installed incrementally in the GAA for this resource over the next 20 to 35 years, would likely require hard protection atop portions of the route (see the New cable emplacement/maintenance IPF). Any new towers, buoys, or piers would also create	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	Structure-oriented fishes are attracted to these locations. These impacts are local and often permanent. Fish aggregation could be considered adverse, beneficial, or neutral.	uncommon relief in a mostly sandy seascape. Structure-oriented fishes could be attracted to these locations. Abundance of certain fishes could increase. These impacts are local and could be permanent.	measurable effect on finfish or EFH and are not analyzed.	onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	would have no measurable effect on finfish or EFH and are not analyzed.
Presence of structures: Habitat conversion	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. 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 hard-bottom and/or complex habitat; structure-oriented species thus benefit on a constant basis. 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 GAA over the next 20 to 35 years, would likely require hard protection atop portions of the route (see New cable emplacement/maintenance row). 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). 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).	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Presence of structures: Migration disturbances	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. Human-made structures in the marine environment (e.g., shipwrecks, artificial reefs, and oil platforms), can attract finfish 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 (Fabrizio et al. 2014; Moser and Shepherd 2009; 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 could attract finfish 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 (Fabrizio et al. 2014; Moser and Shepherd 2009; Secor et al. 2018). Migratory animals would likely be able to proceed from structures unimpeded.	See Section 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Presence of structures: Transmission cable infrastructure	See other sub-IPFs within the Presence of structures IPF.	See other sub-IPFs within the Presence of structures IPF	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Sediment deposition and burial	Ongoing sediment dredging for navigation purposes and installation of permitted OSW COP projects can result in fine sediment deposition. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local and limited to the emplacement corridor. Sediment	No future activities were identified within the GAA for this resource other than ongoing activities.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	deposition could have negative impacts on eggs and larvae, including smothering and loss of fitness. Impacts could vary based on season/time of year.				would have no measurable effect on finfish or EFH and are not analyzed.
Vessel traffic	Ongoing OSW and non-OSW activities that contribute to this IPF include permitted and constructed OSW COP projects, commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel impacts are largely associated with noise, as discussed above.	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 30 years. Even with increased port visits by deep draft vessels, this is still a relatively small adjustment when considering the whole of New England vessel traffic. Vessel traffic is expected to continue at or near current levels.	Construction and O&M vessel cooling systems could entrain planktonic fish eggs and larvae, leading to injury or mortality of some finfish, including EFH individuals. However, these effects are not expected to be measurable relative to natural mortality rates, which can range from 1 to 10% per day or higher (White et al. 2014) and are therefore unlikely to be significant at the population level. Therefore, vessel traffic effects on finfish and EFH from the construction, O&M, and decommissioning of planned and potential future OSW energy projects would be **negligible** adverse relative to baseline conditions in the affected environment.	Vessels used for Project construction, O&M, and decommissioning could entrain planktonic finfish eggs and larvae in their cooling systems, leading to injury or mortality of individuals. However, these effects are not expected to be measurable relative to natural mortality rates and are therefore unlikely to be significant at the population level. Therefore, vessel traffic effects on finfish and EFH from Project construction, O&M, and decommissioning would be **negligible** adverse. The construction and O&M of the Proposed Action and Alternatives C through F and other planned and potential future OSW energy projects would require the use of construction and operational vessels. This would increase the number of vessels operating in the finfish and EFH GAA for the foreseeable future. While the number of vessels operating in the GAA is large, the number of individual eggs and larvae exposed to entrainment-related mortality effects from individual vessels is negligible relative to natural mortality rates. Therefore, vessel traffic cumulative effects on finfish and EFH from the construction, O&M, and decommissioning of the Proposed Action and Alternatives C through F in combination with other planned and potential future OSW energy projects would be **negligible** adverse relative to baseline conditions in the affected environment.	Similar impacts to the Proposed Action and Alternatives C through F. Therefore, vessel traffic effects on finfish and EFH from Project construction, O&M, and decommissioning would be **negligible** adverse. Vessel traffic cumulative effects on finfish and EFH from the construction, O&M, and decommissioning of Alternatives G in combination with other planned and potential future OSW energy projects would be **negligible** adverse relative to baseline conditions in the affected environment.
Climate change: Ocean acidification	Continuous carbon dioxide emissions causing ocean acidification could contribute to reduced growth or the decline of finfish and EFH over the course of the next 35 years.	No future activities were identified within the GAA for this resource other than ongoing activities.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Climate change: Warming and sea	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the	See above.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
level rise, altered habitat/ ecology	next 35 years, influencing the distributions of finfish and EFH. This sub-IPF has been shown to affect the distribution of fish in the northeast United States, with several species shifting their centers of biomass either northward or to deeper waters (Hare et al. 2016).		marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Climate change: Warming and sea level rise, altered migration patterns	See above.	See above.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Climate change: Warming and sea level rise, disease frequency	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 35 years, influencing the frequencies of various diseases of finfish.	See above.	See Sections 3.13.2.2.2 and 3.13.2.3.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.4 through 3.13.2.7 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.8 through 3.13.2.9 and Section 3.13.2.1, Table 3.13-3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.

*Includes all constructed and permitted COP projects within the finfish and EFH GAA: Block Island, SFWF, Vineyard Wind 1, and Coastal Virginia Offshore Wind.

Marine Mammals

Table E2-5. Summary of Activities and the Associated Impact-Producing Factors for Marine Mammals

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Fuel/fluids/hazmat	Constructed and permitted OSW COP projects can accidentally release an estimated 900,000 gallons of fuel, oils, or other hazardous materials in the GAA. See Table E1-4 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 affects attributed to oil exposure (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008; Smith et al. 2017; Sullivan et al. 2019; Takeshida et al. 2017).	Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases described for ongoing activities.	**Offshore:** BOEM prohibits the discharge or disposal of solid debris into offshore waters during any activity associated with the construction and operation of offshore energy facilities (30 CFR 250.300). The USCG similarly prohibits the dumping of trash or debris capable of posing entanglement or ingestion risk (MARPOL, Annex V, Public Law 100−220 (101 Stat. 1458)). Baulch and Perry (2014) identified ingested debris as the likely cause of mortality in 22% of beached marine mammal carcasses. Approximately 50% of marine mammal species worldwide have been documented ingesting marine litter (Werner et al. 2016). While development of future OSW facilities and associated marine	**Offshore:** Construction vessels and offshore structures pose a theoretical source of marine debris and entanglement risk and accidental discharges of petroleum products and other toxic substances. Marine debris is a known source of adverse effects to marine mammals (Laist 1997; NOAA-MDP 2014a, 2014b). Revolution Wind would follow strict oil spill prevention and response procedures during all Project phases; would comply with all debris and pollution requirements; and has developed a detailed spill response and containment plan as a Project EPM. These regulatory requirements and the EPM would effectively avoid releases of abandoned marine debris and would avoid and minimize	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, effects on marine mammals from this impact mechanism would be **negligible** adverse for Alternative G. The risk to marine mammals from trash and debris from Alternative G in combination with those from other planned and potential future activities would be **negligible** adverse. Moreover, Alternative G would similarly include the inspection of offshore structures and removal of derelict fishing gear and other accumulated debris. These would provide a **minor** benefit by removing potentially harmful marine debris from the environment.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	Additionally, accidental releases could result in impacts on marine mammals due to effects to prey species (see Table E2-4). All vessels would comply with USCG requirements and BSEE regulations for the prevention and control of oil and fuel spills.		vessels could be a source of accidental releases of trash and debris, BOEM and USCG requirements would effectively avoid and minimize impacts such that the resulting effects to marine mammals would be **negligible** adverse. BOEM also requires applicants to develop spill response and containment plans to quickly address accidental spills of fuels, lubricants, and other contaminants. A total of approximately 34 million gallons of coolants, fuels, oils, and lubricants could be stored within WTG foundations and OSSs across all projected OSW projects along the Atlantic Coast. A large spill of toxic materials (fuels, lubricants, and other contaminants) could potentially injure or kill several individual marine mammals and adversely affect habitat suitability and would require extensive mitigation to offset. All future OSW projects would be required to comply with regulatory requirements related to the prevention and control of accidental spills administered by the USCG and the BSEE. Oil spill response plans are required for each project and would provide for rapid spill response, cleanup, and other measures that would help to minimize potential impact on affected resources. Given the low probability of a large spill event, impacts to marine mammals from this IPF are likely to be **negligible** adverse.	impacts from accidental spills such that adverse effects on marine mammals are unlikely to occur. In the unlikely event that an accidental spill should occur, individual marine mammals could be injured or killed; habitat suitability could be adversely affected; and extensive mitigation would be required. However, due to the low likelihood of such an event, the temporary nature of the impacts, and established EPMs, effects on marine mammals from this impact mechanism would be **negligible** adverse for the Proposed Action and Alternatives C through F. Existing and planned future OSW-energy development could result in the accidental release of water quality contaminants or trash/debris, which could theoretically lead to an increase in debris and pollution in the marine mammal GAA (see Section 3.15.1 for characterization of existing marine pollution conditions). Compliance with debris and pollution requirements would effectively minimize releases of trash and debris. Given these restrictions, the risk to marine mammals from trash and debris from the Proposed Action and Alternatives C through F in combination with those from other planned and potential future activities is **negligible** adverse. Moreover, the Proposed Action and Alternatives C through F would similarly include the inspection of offshore structures and removal of derelict fishing gear and other accumulated debris. This would provide a **minor** benefit by removing potentially harmful marine debris from the environment.	
Accidental releases: Trash and debris	Constructed and permitted OSW COP projects can potentially generate operational waste, including bilge and ballast water, sanitary and domestic wastes, and trash and debris in the GAA. Trash and debris could also be accidentally discharged through fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation; navigation and traffic; survey activities; and cable, line, and pipeline laying, and debris carried in river outflows or windblown from onshore. Accidental releases of trash and	As population and vessel traffic increase gradually over the next 35 years, accidental release of trash and debris could increase. Trash and debris could continue to be accidentally released through fisheries use and other offshore and onshore activities. There could 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	See Accidental releases: Fuel/fluids/hazmat for analysis.	See Accidental releases: Fuel/fluids/hazmat for analysis.	See Accidental releases: Fuel/fluids/hazmat for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	debris are expected to be low quantity, local, 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 to individuals to population-level impacts (Browne et al. 2015). All vessels would adhere to federal, state, and local regulations regarding disposal of solid and liquid wastes.	in cases of debris interactions, as well as blockage of the digestive tract, disease, injury, and malnutrition (Baulch and Perry 2014).			
EMFs	Constructed and permitted OSW COP projects can generate EMF and substrate heating effects, altering the environment for marine mammals. EMFs also 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 DC cables than with AC cables (Normandeau Associates, Inc. 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 GAA are assumed to be installed with appropriate shielding and at a sufficient 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. Further, 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 as a result, impacts on marine mammals would not be expected.	**Offshore:** Under the No Action Alternative, up to 13,469 miles of cable would be added in the GAA, producing EMF in the immediate vicinity of each cable during operations. BOEM anticipates that the proposed offshore energy projects would use HVAC transmission, but HVDC designs are possible and could occur. EMF effects on marine mammals from these future projects would vary in extent and magnitude depending on overall cable length, the proportion of buried vs. exposed cable segments, and project-specific transmission design (e.g., HVAC or HVDC, transmission voltage, etc.). However, measurable EMF effects are generally limited to within inches to tens of feet of cable corridors, and standard design guidance for OSW energy transmission cable installation (i.e., avoiding cable crossings and maintaining a minimum separation) would limit additive EMF effects from adjacent cables. BOEM would additionally require these future submarine power cables to have appropriate shielding and be at a sufficient burial depth to minimize potential EMF effects from cable operations. At least seven existing submarine power and communications cables are present in the vicinity of the RI/MA WEA. These cables would presumably continue to operate and generate EMF effects under the No Action Alternative. While the type and capacity of	**Offshore:** Exponent (2023) modeled EMF levels that could be generated by the RWEC, OSS-link cable, and IACs. They estimated induced magnetic field levels ranging from 147 to 1,071 mG on the bed surface above the buried and exposed RWEC and OSS-link cable and 57 to 522 mG above the IACs (see the EMF summary table in Sections 3.6.2.4.2 and 3.6.2.7.2). Induced field strength would decrease rapidly with distance from the source, dropping below 100 mG within 3.3 feet of the seafloor directly above the cables. Induced magnetic field strength would fall effectively to 0 mG within 25 feet of the centerline of each cable segment. The only exception would occur at the RWEC landing location, where the two cable corridors would approach to within 10 feet. Measurable magnetic field effects would extend between 25 to 50 feet from the outer edge of the combined cable path. The magnetic field effects generated by exposed segments of the IAC, RWEC, and OSS-link cable are comparable in magnitude to the Earth's natural magnetic field, which is on the order of 517 mG within the RWF. Background magnetic field conditions would fluctuate by 1 to 10 mG from the natural field effects produced by waves and currents. The maximum induced electrical field experienced by any organism close to the exposed cable would be no greater than 0.7 mV/m	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, EMF effects on marine mammals would be **negligible** adverse under Alternative G. Due to the reduced total length of IAC under Alternative G as compared to the Proposed Action, the EMF effects under Alternative G would be similar in nature but proportionally less than under the Proposed Action. Cumulative EMF effects on marine mammals resulting from Alternative G combined with existing, planned, and reasonably foreseeable activities would be **negligible** adverse due to the localized nature of effects and limited anticipated exposure.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
			those cables is not specified, the associated baseline EMF effects can be inferred from available literature. Electrical telecommunications cables are likely to induce a weak EMF on the order of 1 to 6.3 µV/m within 3.3 feet (1 m) of the cable path (Gill et al. 2005). Fiber-optic communications cables with optical repeaters would not produce EMF effects. Additionally, literature suggests that most marine species cannot sense low-intensity electric or magnetic fields generated by the HVAC power transmission cables commonly used in OSW energy projects (Gill et al. 2005; Kilfoyle et al. 2018). EMF effects from continued operations of existing submarine power cables would produce similar **negligible** adverse effects on marine mammals for the duration of cable operations because of the localized nature of the effects and limited anticipated exposure.	(Exponent 2023). BOEM has conducted literature reviews and analyses of potential EMF effects from offshore renewable energy projects (CSA Ocean Sciences Inc. and Exponent 2019; Inspire Environmental 2019; Normandeau et al. 2011). These and other available reviews and studies (Gill et al. 2005; Kilfoyle et al. 2018) suggest that most marine species cannot sense low-intensity electric or magnetic fields generated by the HVAC power transmission cables commonly used in OSW energy projects. Normandeau et al. (2011) concluded that marine mammals are unlikely to detect magnetic field intensities below 50 mG, suggesting that these species would be insensitive to EMF effects from Project electrical cables. Project-related EMFs would drop below this threshold and would become undetectable within 3.3 feet (1 m) of the seafloor, except for RWEC cable segments lying on the bed surface. The area exposed to magnetic field effects greater than 50 mG would be small, extending less than 5 feet above the bed surface immediately over the exposed cable segment. The 50-mG detection threshold is theoretical and an order of magnitude lower than the lowest observed magnetic field strength resulting in observed behavioral responses (Normandeau et al. 2011). These factors indicate that the likelihood of marine mammals encountering detectable EMF effects is low, and any exposure would be below levels associated with measurable biological effects. Therefore, EMF effects on marine mammals would be **negligible** adverse under the Proposed Action and Alternatives C through F. Due to the reduced total length of IAC under Alternatives C through F as compared to the Proposed Action, the EMF effects under Alternatives C through F would be similar in nature but proportionally less than under the Proposed Action. Due to the higher capacity of the turbines in Alternative F, there is potential for greater operational noise impacts around each individual turbine, although specifics of these impacts are not certain.	

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				BOEM anticipates that most planned facilities would use HVAC transmission, but some could use HVDC. BOEM would require all future projects to use cable designs and EPMs to minimize EMF impacts on the environment. While the range of EMF impacts would vary by project, they are expected to be similar in magnitude to those described for the Proposed Action. Standard design practices for offshore energy cables would avoid cable crossings and maintain a minimum separation of several hundred feet between parallel cable paths where practicable (CSRIC 2014; Sharples 2011; TÜV SÜD PMSS 2014). This would minimize additive EMF effects from multiple cables. On this basis, cumulative EMF effects on marine mammals resulting from the Proposed Action and Alternatives C through F combined with existing, planned, and reasonably foreseeable activities would be **negligible** adverse due to the localized nature of effects and limited anticipated exposure.	
Bycatch	Bycatch is a significant population stressor for smaller cetaceans and pinnipeds. NOAA examined the bycatch of 10 species of cetaceans and pinnipeds from the Mid-Atlantic bottom trawl fishery. Mean annual serious injury and mortality estimates for eight of the 10 species were below their potential biological removal (PBR) levels. Bycatch occurs in various gillnet and trawl fisheries in New England and the Mid-Atlantic Coast, with hotspots driven by marine mammal density and fishing intensity (Lewison et al. 2014; NMFS 2018a).	No future activities were identified within the marine mammal GAA other than ongoing activities.	A range of monitoring activities have been proposed to evaluate the short-term and long-term effects of existing and planned OSW development on biological resources and are also likely for future wind energy projects on the OCS. Some of these monitoring activities are likely to affect marine mammals through the potential for bycatch and/or injury by sample collection gear. Biological monitoring uses the same types of methods and equipment employed in commercial fisheries, meaning that impacts would be similar in nature but reduced in extent in comparison impacts from current and likely future fishing activity. Monitoring activities are commonly conducted by commercial fishers under contract who would otherwise be engaged in fishing activity. As such, research and monitoring activities related to OSW would not necessarily result in an increase in bycatch-related impacts on marine mammals, although the distribution of those impacts could change. Therefore, any bycatch-related impacts on marine mammals would be **negligible** to **minor** adverse and short term in duration.	Revolution Wind is proposing to implement the FRMP as part of the Proposed Action and Alternatives C through F (Revolution Wind and Inspire Environmental 2022). The FRMP employs a variety of survey methods to evaluate the effect of RWF construction and operation on benthic habitat structure and composition and on marine species. The following survey methods could impact marine mammals: Ventless trap surveys to evaluate changes in the distribution and abundance of lobster and Jonah crab in the RWF and adjacent reference areas and Jonah crab, lobster, whelk (Buccinidae), and finfish along the RWEC corridor and adjacent reference areas; these areas would be surveyed 12 times per month for 7 months each for 2 years prior to and at least 2 years following completion of Project construction (4 years total) Otter trawl surveys to assess abundance and distribution of target fish and invertebrate species within the RWF could impact a variety of invertebrate species as bycatch, four times per year for 2 years prior to and at least 2	Similar impacts to Alternatives B through F. Therefore, impacts on marine mammals are anticipated to be **negligible** adverse.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				years following completion of Project construction. These surveys involve similar methods to and would complement other survey efforts conducted by various state, federal, and university entities supporting regional fisheries research and management. Survey fisheries gear (otter trawl surveys, ventless traps, and the anchoring lines and buoys used to secure acoustic telemetry equipment) could pose an entanglement risk to marine mammals. Post-ROD ventless trap surveys would employ ropeless gear retrieval technologies that are consistent with recommendations from NMFS. This would eliminate static vertical lines and surface buoys that are a primary source of gear-related entanglement risk for marine mammals. For trawl surveys, large whale species have the speed and maneuverability to avoid oncoming mobile gear (NMFS 2016), and due to the few proposed trawl surveys and short tow times, impacts on marine mammals are anticipated to be **negligible** adverse. Acoustic telemetry receiver systems pose a negligible risk of harm to marine mammals. Based on the type of equipment and the fact that a small number of receivers deployed (up to 19 total) would be distributed over a large area, BOEM considers the effects of this Project element on marine mammals to be negligible. Similarly, moored and autonomous PAM systems would use the best available technology to reduce any potential risks of entanglement. PAM system deployment would avoid and minimize impacts. Therefore, the effects of this type of survey equipment on marine mammals would be **negligible** adverse.	
Light	Constructed and permitted OSW COP projects are introducing 83 lighted structures into the GAA, as well as lighted vessels. Light sources include marine vessels; offshore buoys and towers; and onshore structures, such as buildings and ports. Onshore structures emit a great deal of light on an ongoing basis, greater than offshore structures. Marine	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.	**Offshore:** The addition of up to 3,088 new offshore structures in the GAA with long-term hazard and aviation lighting, as well as lighting associated with construction vessels, would increase artificial lighting. Orr et al. (2013) concluded that the operational lighting effects from wind farm facilities to marine mammal distribution, behavior, and habitat	**Offshore:** Construction of the RWF and RWEC would introduce mobile and intermittent artificial light sources on construction vessels. The RWF would also introduce stationary artificial light sources in the form of navigation, safety, and work lighting. Revolution Wind would follow BOEM (2021) guidance for construction and structural	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, BOEM anticipates that short- to long-term lighting effects from RWF and RWEC construction, operations, and decommissioning on marine mammals would be **negligible** adverse for Alternative G. The effects of this IPF would be similar under

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	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 could also disrupt natural cycles (e.g., spawning), possibly leading to short-term impacts.		use were uncertain but likely negligible if recommended design and operating practices are implemented. BOEM (2021) would require wind farm developers to comply with current design guidance for avoiding and minimizing artificial lighting effects. On this basis, BOEM anticipates artificial lighting impacts from future wind farm development and other offshore activities would result in **negligible** adverse effects on marine mammals for the duration of the offshore activity.	lighting and would use only the minimum type and amount of lighting required by regulation (see Table F-1 in Appendix F). Therefore, BOEM anticipates that short- to long-term lighting effects from RWF and RWEC construction, operations, and decommissioning on marine mammals would be **negligible** adverse for the Proposed Action. The effects of this IPF would be similar under Alternatives C through F but reduced in extent and to the duration of construction activities. The Proposed Action when combined with planned future activities would develop up to 3,183 offshore WTGs and OSS foundations in the GAA. The construction and O&M of these structures would introduce new short-term and long-term sources of artificial light to the offshore environment in the form of vessel lighting and navigation and safety lighting on the structures, respectively. Given the minimal and localized nature of anticipated lighting effects, the cumulative effects from the Proposed Action and Alternatives C through F and existing and planned future activities on marine mammals would be **negligible** adverse, mostly attributable to existing, ongoing activities.	Alternatives C through F but reduced in extent and to the duration of construction activities. Alternative G, when combined with planned future activities, would develop up to 3,155 offshore WTGs and OSS foundations in the GAA. Cumulative effects from Alternative G and existing and planned future activities on marine mammals would be **negligible** adverse, mostly attributable to existing, ongoing activities.
New cable emplacement/ maintenance	Constructed and permitted OSW COP projects are introducing an estimated 498 miles of new offshore cable in the GAA. This and other non-OSW cable maintenance activities can disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances would be local 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 since 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 grey seals in the North Sea. One tracked individual was blind in both eyes but otherwise healthy. Despite being blind,	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. 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 could result in temporary, short-term impacts on some marine mammal prey species (see Table E2-4).	See Section 3.15.2.2.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	observed movements were typical of the other study individuals, indicating that visual cues are not essential for grey seal foraging and movement (McConnell et al. 1999). If elevated turbidity caused any behavioral responses such as avoiding 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 could result in temporary, short-term impacts on marine mammal prey species (see Table E2-4).				
Noise: Aircraft	Aircraft routinely travel in the marine mammal GAA. 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 could 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. Similarly, aircraft have the potential to disturb hauled out seals if aircraft overflights occur within 2,000 feet (610 m) of a haul out area (Efroymson et al. 2000). However, this disturbance would be temporary, 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 surveys 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 could respond with behavior 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.	See Section 3.15.2.2.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
Noise: G&G	Noise from G&G surveys associated with permitted OSW COP projects may occur in the GAA. 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 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	Same as ongoing activities, with the addition of possible future oil and gas exploration surveys.	See Section 3.15.2.2.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	within the area where sound levels are above relevant harassment thresholds associated with an operating sound source to reduce the potential for behavioral responses and injury (PTS/TTS) close to the sound source. The magnitude of effects, if any, is intrinsically related to many factors, including acoustic signal characteristics, behavioral state (e.g., migrating), biological condition, distance from the source, duration and level of the sound exposure as well as environmental and physical conditions that affect acoustic propagation (NOAA 2018).				
Noise: Turbines	Noise from turbine operation associated with permitted and built OSW COP projects occurs in the GAA. Marine mammals would be able to hear the continuous underwater noise of operational WTGs. As measured at the BIWF, this low frequency noise barely exceeds ambient levels at 164 feet (50 m) from the WTG base. Based on the results of Thomsen et al. (2015) and Kraus et al. (2016), sound pressure levels 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-OSW development.	See Section 3.15.2.2.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
Noise: Pile driving	Noise from pile driving associated with permitted OSW COP projects is occurring during installation of foundations for offshore structures. Noise from pile driving also occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seafloor 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 could 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 have 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.	No future activities were identified within the marine mammal GAA other than ongoing activities.	See Section 3.15.2.2.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat and are not analyzed.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	BOEM assumes that all ongoing and potential future activities would be conducted in accordance with a project-specific IHA to minimize impacts on marine mammals.				
Noise: Cable laying/trenching	N/A	Cable laying impacts resulting from future non-OSW activities would be identical to those described for future OSW projects.	See Section 3.15.2.2.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
Noise: Vessels	Ongoing OSW and non-OSW activities that contribute to this sub-IPF include permitted and built OSW COP projects, 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 could 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 m) 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). Since lower frequencies propagate farther away from the sound source compared to higher frequencies, low-frequency cetaceans 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 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 and no stock or population-level effects would be expected.	See Section 3.15.2.2.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat and are not analyzed.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
Port utilization: Expansion	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing	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	The development of an OSW industry on the Mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Port improvements could lead to an increase in vessel traffic during construction (see Section	Several regional ports could be used during Project construction, including ports in Baltimore, MD; New Bedford, MA; New London, CT; Norfolk, VA; Paulsboro, NJ; and Providence, RI, as well as Europe. The development of an OSW industry on the Mid-	Similar impacts to the Proposed Action and Alternatives C through F. Therefore, port utilization impacts associated with the Project would be **negligible** adverse under all Project alternatives.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	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 could affect marine mammals, but the response would be expect 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, short term and would be similar to those described under the New cable emplacement/maintenance IPF above.	to Maine is that port activity would increase modestly. The ability of ports to receive the increase in larger ships would require port modifications. Future channel-deepening activities are being undertaken to accommodate deeper draft vessels for the Panama Canal locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and could 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).	3.16), O&M, and decommissioning. The resulting change in vessel traffic in the GAA cannot be predicted because, while some ports have been identified as possibilities for expansion, no specific project plans have been proposed. Therefore, impacts would be **negligible** adverse. Any future port expansion and associated increase in vessel traffic would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential effects on marine mammals regionwide.	Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects, but no specific improvements are included in the Proposed Action and Alternatives C through F. Any future port expansion would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential environmental effects. However, these localized habitat impacts are unlikely to affect marine mammals within the GAA. Therefore, port utilization impacts associated with the Project would be **negligible** adverse under all Project alternatives. Future actions, should they occur, could involve activities like dredging, increases in vessel activity and underwater noise, and the expansion or development of new structures. These activities could lead to adverse effects on coastal and estuarine habitats used by marine mammals and their prey species. These projects could result in cumulative effects on marine mammals, but the extent and significance of these effects cannot be evaluated because no project proposals have been developed. No port improvements have been proposed as part of the Proposed Action and Alternatives C through F and therefore cumulative impacts would be **negligible** adverse. The environmental effects resulting from any future port expansions would be evaluated in independent NEPA analysis, ESA and MMPA compliance documents, and other regulatory approvals for each project.	No port improvements have been proposed as part of Alternative G, and therefore cumulative impacts would be **negligible** adverse. The environmental effects resulting from any future port expansions would be evaluated in independent NEPA analysis, ESA and MMPA compliance documents, and other regulatory approvals for each project.
Presence of structures: Entanglement or ingestion of lost fishing gear	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. There are also more than 130 artificial reefs in the Mid-Atlantic region. This sub-IPF could 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 BIWF could be considered artificial reefs and could have higher levels of recreational fishing, which increases the chances of marine mammals encountering lost fishing gear, resulting in possible ingestions, entanglement, injury, or death of individuals (Moore and van der Hoop 2012), if present	No future activities were identified within the marine mammal GAA other than ongoing activities.	See Section 3.15.2.2.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	nearshore where these structures are located. There are very few, if any, areas within the OCS GAA 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	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. There are also more than 130 artificial reefs in the Mid-Atlantic region. Hard-bottom (scour control and rock mattresses) and vertical structures (bridge foundations and BIWF WTGs) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (NMFS 2015; Taormina et al. 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 seals and small odontocetes compared to the surrounding soft bottoms.	The presence of structures associated with non-OSW development in nearshore coastal waters has the potential to provide habitat for seals and small odontocetes as well as preferred prey species. This reef effect has the potential to result in long-term, low-intensity benefits. Bridge foundations would continue to provide foraging opportunities for seals and small odontocetes with measurable benefits to some individuals. Hard-bottom (scour control and rock mattresses used to bury the offshore export cables) and vertical structures (i.e., WTG and ESP foundations) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (Causon and Gill 2018; Taormina et al. 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.	See Section 3.15.2.2.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
Presence of structures: Avoidance/Displacement	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. The presence of structures changes the offshore environment, and their presence could affect marine mammal behavior; however, the likelihood and significance of these effects are difficult to determine. Based on available science, the physical presence of the monopile foundations is unlikely to pose a barrier to the movement of large marine mammals, and even less likely to impede the movement of smaller marine mammals.	Not contemplated for non-OSW facility sources.	See Section 3.15.2.2.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
Presence of structures: Behavioral disruption (breeding and migration)	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. The presence of structures changes the offshore environment, and their presence could affect marine mammal behavior; however, the likelihood and significance of	Not contemplated for non-OSW facility sources.	See Section 3.15.2.2.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	these effects are difficult to determine. Based on available science, structures could cause localized changes to prey distribution but do not suggest a major change in prey availability. Impacts to movement or displacement are described in other cells.			effect on marine mammals and are not analyzed.	no measurable effect on marine mammals and are not analyzed.
Presence of structures: Displacement into higher risk areas (vessels and fishing)	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. The presence of structures changes the offshore environment, and their presence could affect marine mammal behavior; however, the likelihood and significance of these effects are difficult to determine. Some research has suggested that wind farm operations may lead to long-term displacement of species such as harbor porpoise, but the evidence is mixed, and observed changes in abundance could be more indicative of general population trends than an actual wind farm effect (Nabe-Nielsen et al. 2011; Tielmann and Carstensen 2012; Vallejo et al. 2017).	Not contemplated for non-OSW facility sources.	See Section 3.15.2.2.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
Traffic: Vessel collisions	Current OSW and non-OSW activities that are contributing to this sub-IPF include permitted and built OSW COP projects, port traffic levels, fairways, traffic separation schemes, 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 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	Vessel traffic associated with non-OSW development has the potential to result in an increased collision risk. While these impacts would be high consequence, the patchy distribution of marine mammals makes stock or population-level effects unlikely (Navy 2018).	See Section 3.15.2.2.2 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat and are not analyzed.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	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).				
Sediment deposition and burial	The USACE and/or private ports could undertake dredging projects periodically. Installation of permitted OSW COP projects can also result in fine sediment deposition. Where dredged materials are disposed, marine species could be affected. However, such areas are typically recolonized naturally in the short term. Most species in the GAA are adapted to the turbidity and periodic sediment deposition that occur naturally in the GAA.	No future activities were identified within the GAA for marine mammals other than ongoing activities.	Seafloor disturbance during the installation of transmission cables, sea-to-shore transition construction, and dredging activities would result in elevated suspended sediment concentrations in the water column. Based on modeled and observed TSS impacts for the Proposed Action and other regional wind farm projects (Elliot et al. 2017; RPS 2022; Vinhateiro et al. 2018), and maximum water column TSS concentrations could range from several hundred to several thousand mg/L in proximity to the disturbance and would dissipate below 100 mg/L, usually within minutes to hours of the disturbance, depending on the types of sediments affected. In locations with predominantly sand or coarser sediments, water column effects would be limited to short-term TSS pulses below 100 mg/L extending a few hundred feet downcurrent within approximately 20 feet of the seafloor and dissipating to background conditions within approximately 1 to 2 hours after disturbance. Available information on marine mammal sensitivity to TSS indicates that water quality impacts would have negligible effects on marine mammals. First, periodic TSS concentrations on the order of 100 mg/L at or near the seafloor are within the range of baseline variability. Marine mammals that forage on or near the seafloor are unlikely to be affected by a short-term increase in TSS that is comparable to existing conditions. For example, researchers have observed that visually impaired grey and harbor seals are able to navigate and locate prey just as effectively as their fully sighted counterparts (McConnell et al. 1999; Newby et al. 1970; Todd et al. 2015), indicating that short-term visual impairment would have no measurable effect on foraging ability. While research on TSS sensitivity in dolphins and large whales is generally lacking, these species developed the ability to echolocate by evolving in	RPS (2022) modeled the magnitude and extent of anticipated TSS concentrations resulting from RWF and RWEC construction. Maximum water column TSS concentrations could exceed 500 mg/L in proximity to the disturbance. The majority of water column effects would be limited to short-term TSS pulses below 100 mg/L, occurring in plumes extending approximately 6 to 20 feet off the seafloor and 580 to 4,134 feet downcurrent. Dredging used to level the seafloor and achieve greater burial depths for RWEC installation would produce TSS plumes with concentrations up to 100 mg/L extending from the seafloor to the surface extending from 3,067 to 5,838 feet downcurrent. In most locations, TSS concentrations would dissipate to background conditions within approximately 1 to 2 hours after disturbance; however, in selected locations—specifically at the sea-to-shore transition construction area—TSS concentrations greater than 100 mg/L could linger for up to 36 hours. These modeled estimates are similar to those developed for BIWF construction. The observed extent of TSS impacts at the BIWF turned out to be considerably lower than the modeled estimates (Elliot et al. 2017), indicating that the potential impacts described here are likely conservative. Both the modeled TSS effects, which are conservatively high, and the observed TSS effects were short term and within the range of baseline variability. Based on available information (see No Action Alternative at left) a short-term reduction in visibility would have no meaningful effects on communication, foraging, and predator avoidance, particularly given that measurable TSS impacts would be limited to within 10 to 12 feet of the seafloor in the open ocean waters where marine mammals are most likely to occur.	Similar impacts to the Proposed Action and Alternatives C through F. Therefore marine mammal exposure to water quality effects resulting from construction of all Project alternatives, including Alternative G, would be **negligible** adverse because of the limited sensitivity of marine mammals to TSS and the temporary nature of the impact. Alternative G would result in a shorter overall length of IAC installation, proportionally reducing the extent and duration of suspended sediment impacts relative to the Proposed Action. Those species that are exposed to elevated TSS would unlikely experience measurable effects on behavior, foraging success, or communication. Sediment deposition and burial effects on marine mammals resulting from Project O&M and decommissioning under Alternative G would be temporary **negligible** adverse. BOEM estimates a cumulative total of up to 105,390 acres of seafloor disturbance for Alternative G plus all other future OSW projects in the GAA. As discussed above, TSS effects on marine mammals are likely to be negligible adverse because of limited potential exposure to elevated TSS. No population-level effects on marine mammals are expected from reduced water quality. Therefore, Alternative G when combined with past, present, and reasonably foreseeable activities would result in **negligible** adverse cumulative effects on marine mammals.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
			environments having variable and often low visibility (Tyack and Miller 2002). This suggests that a short-term reduction in visibility would have no effect on communication, foraging success, and predator avoidance and would not result in displacement or other observable changes in behavior. These factors indicate that marine mammal exposure to water quality effects resulting from construction of future OSW farms would be limited. Those species that are exposed to elevated TSS would be unlikely to experience measurable effects on behavior, foraging success, or communication. On this basis, water quality effects on marine mammals resulting from future OSW farm construction would be **negligible** adverse and short term in duration.	These factors indicate that marine mammal exposure to water quality effects resulting from construction of all Project alternatives would be **negligible** adverse under the Proposed Action and Alternatives C through F because of the limited sensitivity of marine mammals to TSS and the temporary nature of the impact. Alternatives C through F would result in a shorter overall length of IAC installation, proportionally reducing the extent and duration of suspended sediment impacts relative to the Proposed Action. Those species that are exposed to elevated TSS would be unlikely to experience measurable effects on behavior, foraging success, or communication. Seafloor disturbance during O&M activities would be limited under all Project alternatives, but reduced in extent under Alternatives C through F. As noted above, the cables are unlikely to require repair or maintenance, but up to 10% of cable protection could need to be replaced over the life of the Project. Replacement of the cable protection could result in localized, temporary increases in TSS. However, consistent with impacts of cable installation, suspended sediment plumes would be limited to within 10 to 12 feet of the seafloor in the open ocean waters where marine mammals are most likely to occur. Potential effects of removal of the cable during decommissioning would be similar in nature to those anticipated for cable installation or replacement of cable protection. Thus, sediment deposition and burial effects on marine mammals resulting from Project O&M and decommissioning under the Proposed Action and Alternatives C through F would be temporary **negligible** adverse. BOEM estimates a cumulative total of up to 105,390 acres of seafloor disturbance for the Proposed Action and Alternatives C through F plus all other future OSW projects in the GAA. As discussed above, TSS effects on marine mammals are likely to be negligible adverse because of limited potential exposure to elevated TSS. No population-level effects on marine mammals are expected from reduced	

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				water quality. Therefore, the Proposed Action and Alternatives C through F when combined with past, present, and reasonably foreseeable activities would result in **negligible** adverse cumulative effects on marine mammals.	
Climate change: Warming and sea level rise, storm severity/ frequency	Increased storm frequency could result in increased energetic costs for marine mammals and reduced fitness, particularly for juveniles, calves, and pups.	No future activities were identified within the GAA for marine mammals other than ongoing activities.	See Section 3.15.2.2.2 for analysis.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of impacts.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of impacts.
Climate change: Ocean acidification	This sub-IPF has the potential to lead to long-term, high-consequence impacts on marine ecosystems by contributing to reduced growth or decline of invertebrates that have calcareous shells.	No future activities were identified within the marine mammal GAA other than ongoing activities.	See Section 3.15.2.2.2 for analysis.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of impacts.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of impacts.
Climate change: Warming and sea level rise, altered habitat/ecology	This sub-IPF has the potential to lead to long-term, high-consequence impacts on marine mammals as a result of changes in distribution, reduced breeding and/or foraging habitat availability, and disruptions in migration.	No future activities were identified within the marine mammal GAA other than ongoing activities.	See Section 3.15.2.2.2 for analysis.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of impacts.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of impacts.
Climate change: Warming and sea level rise, altered migration patterns	This sub-IPF has the potential to lead to long-term, high-consequence impacts on marine mammal habitat use and migratory patterns. For example, the NARW appears to be migrating differently and feeding in different areas in response to changes in prey densities related to climate change (MacLeod 2009; Nunny and Simmonds 2019; Record et al. 2019).	No future activities were identified within the marine mammal GAA other than ongoing activities.	See Section 3.15.2.2.2 for analysis.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of impacts.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of impacts.
Climate change: Warming and sea level rise, increased disease frequency	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the frequencies of various diseases of marine mammals, such as Phocine distemper. Climate change is clearly influencing infectious disease dynamics in the marine environment; however, no studies have shown a definitive causal relationship between any components of climate change and increases in infectious disease among marine mammals. This is due in large part to a lack of sufficient data and the likely indirect nature of climate change's impact on these diseases. Climate change could affect the incidence or prevalence of infection, the	No future activities were identified within the marine mammal GAA other than ongoing activities.	See Section 3.15.2.2.2 for analysis.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of impacts.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	frequency or magnitude of epizootics, and/or the severity or presence of clinical disease in infected individuals. There are a number of potential proposed mechanisms by which this might occur (see summary in Burge et al. 2014).				
Climate change: Warming and sea level rise, storm severity/frequency, sediment erosion, deposition	Increased storm frequency could result in increased energetic costs for marine mammals, reduced fitness, particularly for juveniles, calves, and pups. Erosion could impact seal haul outs, reducing their habitat availability, especially as sea walls and other obstructions are added, blocking seals access to shore.	No future activities were identified within the marine mammal GAA other than ongoing activities.	See Section 3.15.2.2.2 for analysis of impacts.	See Sections 3.15.2.3 and 3.15.2.4 and Section 3.15.2.1, Table 3.15-4 for analysis of impacts.	See Section 3.15.2.5 and Section 3.15.2.1, Table 3.15-4 for analysis of impacts.

*Includes all constructed and permitted COP projects within the marine mammals GAA: Block Island, SFWF, Vineyard Wind 1, and Coastal Virginia Offshore Wind.

Sea Turtles

Table E2-6. **Summary of Activities and the Associated Impact-Producing Factors for Sea Turtles**

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Fuel/fluids/hazmat	Constructed and permitted OSW COP projects can accidentally release an estimated 900,000 gallons of fuel, oils, or other hazardous materials in the GAA. See Table E1-4 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. 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 (Bembenek-Bailey et al. 2019; Camacho et al. 2013; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Additionally, accidental releases could result in impacts on sea turtles due to effects on prey species (see Table E2-4). All vessels would comply with USCG requirements and BSEE regulations for the prevention and control of oil and fuel spills.	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 2010; Wallace et al. 2010) or sublethal effects on individual fitness, including adrenal effects, dehydration, hematological effects, increased disease incidence, liver effects, poor body condition, skin effects, skeletomuscular effects, and several other health effects that can be attributed to oil exposure (Bembenek-Bailey et al. 2019; Camacho et al. 2013; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Additionally, accidental releases could result in impacts on sea turtles due to effects on prey species (see Table E2-4).	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Trash and debris	Constructed and permitted OSW COP projects can potentially generate operational waste, including bilge and ballast water, sanitary and domestic wastes, and trash and debris in the GAA. Trash and debris could also be accidentally discharged through fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation; navigation and traffic; survey activities; cable, line, 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, local, 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; Schuylar et al. 2014). In addition to plastic debris, ingestion of tar, paper, Styrofoam™, wood, reed, feathers, hooks, lines, and net fragments have 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 could include dietary dilution, chemical contamination, depressed immune system function, and poor body condition as well as reduced growth rates, fecundity, and reproductive success. However, these effects are cryptic, and clear causal links are difficult to identify (Nelms et al. 2016). All vessels would adhere to federal, state, and local regulations regarding disposal of solid and liquid wastes.	Trash and debris could be accidentally discharged through fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation; navigation and traffic; survey activities; cable, line, 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, local, 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; Schuylar 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).	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Anchoring	Constructed and permitted OSW COP projects are introducing an estimated 944 acres of anchoring in the GAA. Vessel anchoring related to other ongoing military use and survey, commercial, and recreational activities also	Impacts from anchoring could occur on a semiregular basis over the next 30 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel	Future OSW projects could disturb up to 8,427 acres of seafloor from anchoring/mooring activities and the installation of associated undersea cables during OSW energy development, causing an increase in suspended	Sea turtles near the Project would likely be foraging, and prey items could include benthic species affected by vessel anchoring and cable emplacement/maintenance. The associated disturbance would be temporary; however,	Project construction and installation of Alternative G would have similar impacts to the Proposed Action and Alternatives C through F. Therefore, impact of Project activities associated

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	continues to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor.	traffic. These impacts would include increased turbidity levels and potential for contact causing mortality of sea turtles. All impacts would be localized; turbidity would be temporary; impacts from contact would be recovered in the short term.	sediment. This disturbance would be both localized and temporary in duration. Entanglement risks to sea turtles from vessel anchoring and cable emplacement are not anticipated. Only larger construction and O&M vessels would anchor to the seafloor, using large heavy anchor chains. No lines or rigging are anticipated for cable installation, and transmission cables and jet plow umbilicals are large in diameter, relatively inflexible, and under constant tension. The likelihood of sea turtle entanglement under these conditions is discountable. In general, impacts to benthic habitats are unlikely to directly affect sea turtles but could indirectly affect these species through impacts on their prey. As discussed in Section 3.6, BOEM anticipates that impacts to benthic habitats and invertebrates would likely range from minor to moderate adverse. Certain sea turtle species, such as loggerheads, that feed on benthic invertebrates could experience short-term reductions in prey availability that are limited in extent, potentially offset by long-term increases in prey abundance from maturing reef effects. Thus, effects of anchoring and new cable emplacement/maintenance on sea turtles under the No Action Alternative would be **negligible** adverse.	some benthic habitat conversion would also occur, as described in Section 3.6. Project construction and installation would temporarily affect available foraging habitat until preconstruction species assemblages are recolonized and recovered. Benthic communities that inhabit dynamic bed (i.e., soft-bottom) habitats typically recover rapidly from construction-related disturbance, usually within 1 year (Dernie et al. 2003; UKBERR 2008), while some organisms associated with complex benthic habitat, like sponges and hydroids, could take a decade or longer to fully recover (Auster and Langton 1999; Collie et al. 2005; Lukens and Selberg 2004; Tamsett et al. 2010). The affected area is also subject to periodic bed disturbance by commercial fishing (CH2M HILL 2018), indicating that construction-related bed disturbance is not expected to measurably alter environmental baseline conditions. Because impacts to foraging habitat are mostly temporary and localized, the impact of Project activities associated with seafloor disturbance on sea turtles would be **negligible** adverse under the Proposed Action and Alternatives C through F but incrementally reduced under Alternatives C through F (a comparison of the benthic habitat disturbance footprints under the different configurations of Alternatives C through E and the Proposed Action is provided in Table 3.6-8, Table 3.6-9, and Table 3.6-10 in Section 3.6). Entanglement risks to sea turtles from vessel anchoring and cable emplacement are not anticipated. Only larger construction and O&M vessels would anchor to the seafloor, using large heavy anchor chains. Per the COP, no divers would be used and no lines or rigging are anticipated for cable installation and maintenance. Transmission cables and jet plow umbilicals are large in diameter, relatively inflexible, and under constant tension throughout installation. Potential anchoring impacts during O&M and decommissioning would be similar to the construction phase but reduced due to fewer anchored vessels. As stated in Section 3.5.2 of the COP, the Project does not anticipate that the IAC, OSS-link cable, and RWEC would	with seafloor disturbance on sea turtles under Alternative G would be **negligible** adverse but incrementally reduced relative to the proposed action and configurations of Alternatives D through F that have more proposed WTGs. A comparison of the benthic habitat disturbance footprints under the different configurations of alternatives and the Proposed Action is provided in Table 3.6-8, Table 3.6-9, and Table 3.6-10 in Section 3.6. Alternative G would incrementally reduce the extent of O&M- and decommissioning-related impacts on sea turtles resulting from Project construction and would therefore be **negligible** adverse because of the temporary and localized nature of the potential impacts. BOEM estimates a cumulative total of 10,520 acres of anchoring and mooring-related disturbance and 104,781 acres of cabling-related disturbance for Alternative G combined with all other future OSW projects within the GAA. Although increases in foraging effort or displacement due to turbidity could occur to individual sea turtles, these temporary effects are not anticipated to lead to population-level effects on sea turtle populations. Vessel anchoring and cable emplacement during construction, O&M, and decommissioning are not anticipated to involve equipment, lines, or rigging that could pose a potential entanglement risk to sea turtles. Therefore, Alternative G when combined with past, present, and reasonably foreseeable projects would result in **negligible** adverse cumulative impacts to sea turtles.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				require significant maintenance. The cables themselves are unlikely to require repair, but up to 10% of cable protection could need to be replaced over the life of the Project. Effects to sea turtles from cable protection maintenance would result primarily from underwater noise, disturbance, and collision risk associated with O&M vessel activity. The IAC, OSS-link cable, and RWEC would be removed from the seafloor during Project decommissioning. Alternatives C through F would result in a reduced total length of IAC and a reduced extent of anchoring impacts relative to the Proposed Action. This would incrementally reduce the extent of O&M- and decommissioning-related impacts on sea turtles resulting from Project construction and would therefore be **negligible** adverse under the Proposed Action and Alternatives C through F because of the temporary and localized nature of the potential impacts. BOEM estimates a cumulative total of 5,803 acres of anchoring and mooring-related disturbance and 25,082 acres of cabling-related disturbance for the Proposed Action combined with all other future OSW projects within the GAA. Impacts from Alternatives C through F would be reduced in extent than the Proposed Action. The duration and magnitude of these effects would vary depending on the types of habitats impacted. Impacts on soft-bottom benthic habitats and associated sea turtle forage species would be expected to fully recover within 18 to 24 months, whereas impacts on complex benthic habitats could take a decade or more to fully recover. While increases in foraging effort or displacement due to turbidity could occur to individual sea turtles, these temporary effects are not anticipated to lead to population-level effects on sea turtle populations. Vessel anchoring and cable emplacement during construction, O&M, and decommissioning are not anticipated to involve equipment, lines, or rigging that could pose a potential entanglement risk to sea turtles. Therefore, the Proposed Action and Alternatives C through F when combined with past, present, and reasonably foreseeable projects would	

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				result in **negligible** adverse cumulative impacts to sea turtles.	
Bycatch	Impacts from bycatch are a primary threat to sea turtles (NOAA 2018). A reduction in bycatch has been achieved by the requirement for the use of bycatch mitigation measures. A comparison pre- versus post-regulation mean annual bycatch data for Mid-Atlantic fisheries (otter trawl, gillnet, scallop trawl, scallop dredge, Virginia pound net) showed sea turtle bycatch was reduced from 2,400 incidents to 1,700 and mortality was reduced from 1,000 to 470 based on data over the period 1990 to 2007 (Finkbeiner et al. 2011). In the Atlantic, bycatch occurs in various gillnet and trawl fisheries in New England and the Mid-Atlantic Coast, with hotspots driven by marine mammal density and fishing intensity (Lewison et al. 2014; NMFS 2018a).	No future activities were identified within the GAA for this resource other than ongoing activities	A range of monitoring activities has been proposed to evaluate the short-term and long-term effects of existing and planned OSW development on biological resources and are also likely for future wind energy projects on the OCS. Some of these monitoring activities are likely to affect sea turtles through the potential for bycatch and/or injury by sample collection gear. Biological monitoring uses the same types of methods and equipment employed in commercial fisheries, meaning that impacts to sea turtles would be similar in nature but reduced in extent in comparison to impacts from current and likely future fishing activity. Monitoring activities are commonly conducted by commercial fishers under contract who would otherwise be engaged in fishing activity. As such, research and monitoring activities related to OSW would not necessarily result in an increase in bycatch-related impacts on sea turtles, although the distribution of those impacts could change. Therefore, any bycatch-related impacts on invertebrates would be **negligible to minor** adverse and short term in duration.	Revolution Wind is proposing to implement the FRMP as part of the Proposed Action and Alternatives C through F (Revolution Wind and Inspire Environmental 2022). The FRMP employs a variety of survey methods to evaluate the effect of RWF construction and operation on benthic habitat structure and composition and on marine species. The following survey methods could impact sea turtles: Ventless trap surveys to evaluate changes in the distribution and abundance of lobster and Jonah crab in the RWF and adjacent reference areas and Jonah crab, lobster, whelk (Buccinidae), and finfish along the RWEC corridor and adjacent reference areas; these areas would be surveyed 12 times per month for 7 months each for 2 years prior to and at least 2 years following completion of Project construction (4 years total) Otter trawl surveys to assess abundance and distribution of target fish and invertebrate species within the RWF trawls could impact a variety of invertebrate species as bycatch and would occur four times per year for 2 years prior to and at least 2 years following completion of Project construction. These surveys involve similar methods to and would complement other survey efforts conducted by various state, federal, and university entities supporting regional fisheries research and management. Survey fisheries gear (otter trawls, ventless traps, and the anchoring lines and buoys used to secure acoustic telemetry equipment) could pose an entanglement risk to sea turtles. However, this risk must be considered in the context of ongoing commercial fisheries activity. The FRMP would contract commercial fishing vessels to conduct surveys, using commonly available commercial fishing gear. These contract vessels would likely be engaged in the commercial fishery if not involved in the FRMP, at least at an equivalent, if not greater, level of fishing effort. Therefore, the FRMP would not be likely to measurably change the quantity of	Similar impacts to the Proposed Action and Alternatives C through F. Therefore, the anticipated impacts of the FRMP on sea turtles are anticipated to be **negligible** adverse. Acoustic telemetry receiver systems pose a negligible risk of harm to sea turtles. Based on the type of equipment, deployment near the seafloor, and the small number of receivers deployed (up to 19 in total) over a large area, BOEM considers the effects of this Project element on sea turtles to be **negligible** adverse. Similarly, moored and autonomous PAM systems would use the best available technology to avoid and minimize impacts on the environment. Based on their size and configuration of their mooring systems, PAM buoys pose an insignificant entanglement risk to sea turtles. Therefore, the effects of this type of survey equipment on sea turtles would likewise be **negligible** adverse under Alternative G.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				fishing gear on the Mid-Atlantic OCS or the amount of fishing effort that sea turtles are exposed to by gear type. Moreover, the FRMP would employ several risk-reduction measures. Post-ROD ventless trap surveys would employ ropeless gear retrieval technologies that are consistent with recommendations from NMFS. This would eliminate static vertical lines and surface buoys that are a primary source of gear-related entanglement risk for sea turtles. All trap and pot gear would be stored dry between surveys to minimize the time that gear is in the water. When considered in combination, the anticipated impacts of the FRMP on sea turtles are anticipated to be **negligible** adverse. Acoustic telemetry receiver systems pose a negligible risk of harm to sea turtles. Based on the type of equipment, deployment near the seafloor, and the small number of receivers deployed (up to 19 in total) over a large area, BOEM considers the effects of this Project element on sea turtles to be **negligible** adverse. Similarly, moored and autonomous PAM systems would use the best available technology to avoid and minimize impacts on the environment. Based on their size and configuration of their mooring systems, PAM buoys pose an insignificant entanglement risk to sea turtles. Therefore, the effects of this type of survey equipment on sea turtles would likewise be **negligible** adverse under the Proposed Action and Alternatives C through F.	
EMFs	Constructed and permitted OSW COP projects can generate EMF and substrate heating effects, altering the environment for sea turtles. EMFs also emanate constantly from installed telecommunication and electrical power transmission cables. Sea turtles appear to have a detection threshold of magnetosensitivity and behavioral responses to field intensities ranging from 0.0047 to 4000 µT for loggerhead turtles, and 29.3 to 200 µT for green turtles, with other species likely similar due to anatomical, behavioral, and life history similarities (Normandeau et al. 2011). Juvenile or adult sea turtles foraging on benthic organisms could be	During operations, future new cables would produce EMF. Submarine power cables in the GAA for sea turtles are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels (BOEM 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. Further, 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	Under the No Action Alternative, the future development of planned wind energy projects would result in up to 13,469 miles of new submarine electrical transmission cables in the GAA for sea turtles. Each cable would generate EMF effects within the immediate proximity. The available evidence indicates that sea turtles are magnetosensitive and orient to the Earth's magnetic field for navigation. Although they could be able to detect magnetic fields as low as 0.05 mG, they are unlikely to detect magnetic fields below 50 mG (Normandeau et al. 2011; Snoek et al. 2016). Potential EMF effects would be reduced by cable shielding and burial to an appropriate depth (typically 4–6 feet). Standard	**Offshore:** There would be no EMF produced during construction of the offshore Project structures. The Project would generate EMF along the length of the IACs and offshore RWEC for the life of the Project until decommissioning. These effects would be most intense at locations where the RWEC cannot be buried and is laid on the bed surface covered by a stone or concrete armoring blanket. Approximately 8.8 miles of the RWEC cable, 0.9 mile of the OSS-link, and 15.5 miles of the IAC could be unburied and would require surface armoring. Exponent (2023) modeled EMF levels that could be generated by the RWEC, OSS-link cable, and IAC.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore there would be no EMF produced during construction of the offshore Project structures. Given the limited extent of measurable magnetic field levels and limited potential for mobile species like sea turtles to encounter field levels above detectable thresholds, the effects of Project-related EMF exposure on sea turtles would be **negligible** adverse for the life of the Project. Impacts would be reduced in extent as compared to the Proposed

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	able to detect magnetic fields while they are foraging on the bottom near the cables and up to potentially 82 feet (25 m) in the water column above the cable. Juvenile and adult sea turtles could 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). 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).	would be low, and as a result, impacts on sea turtles would not be expected.	design guidance for OSW energy transmission cable installation avoids cable crossings where practicable and recommends maintaining a minimum separation of at least several hundred feet between Project features and existing transmission and communication cables to avoid damaging existing infrastructure and for safety during installation (CSRIC 2014; Sharples 2011; TÜV SÜD PMSS 2014). This separation distance would also avoid additive EMF effects from adjacent cables. Although artificial EMF effects on sea turtles are not well studied, the affected areas would be localized around unburied cable segments and limited to within 3 to 7.5 m of the cable surface (CSA Ocean Sciences Inc. and Exponent 2019). Deviations in migration therefore would have a negligible impact on energy expenditure in sea turtles. EMF effects from future OSW development would similarly be **negligible** adverse because of the limited anticipated exposure.	It estimated induced magnetic field levels ranging from 147 to 1,071 mG on the bed surface above the buried and exposed RWEC and OSS-link cable and 57 to 522 mG above the IAC (see Section 3.6). Induced field strength would decrease rapidly with distance from the source, dropping below 100 mG within 3.3 feet of the seafloor directly above the cable. Induced magnetic field strength would fall effectively to 0 mG within 25 feet of the centerline of each cable segment. The only exception would occur at the RWEC landing location, where the two cable corridors would approach to within 10 feet. Measurable magnetic field effects would extend between 25 to 50 feet from the outer edge of the combined cable path. BOEM has conducted literature reviews and analyses of potential EMF effects from offshore renewable energy projects (CSA Ocean Sciences Inc. 2023; Inspire Environmental 2019; Normandeau et al. 2011). These and other available reviews and studies (Gill et al. 2005; Kilfoyle et al. 2018) suggest that most marine species cannot sense very low-intensity electric or magnetic fields at the typical AC power transmission frequencies associated with offshore renewable energy projects. Normandeau et al. (2011) indicate that sea turtles are magnetosensitive and orient to the Earth's magnetic field for navigation, but they are unlikely to detect magnetic fields below 50 mG. The majority of RWEC and IACs would be buried 4 to 6 feet below the bed surface, reducing the magnetic field in the water column below levels detectable to turtles. The transmission cables could produce magnetic field effects above the 50-mG threshold at selected locations where full burial is not possible; these areas would be localized and limited in extent. Magnetic field strength at these locations would decrease rapidly with distance from the cable and drop to 0 mG within 25 feet. Peak magnetic field strength is below the theoretical 50-mG detection limit along the majority of cable length, only exceeding this threshold above the short cable segments laid on the bed surface. Those EMF effects would dissipate below the 50 mG threshold 3.3 feet (1 m) of the seafloor, except	Action, and the total area exposed would vary depending on the configuration selected (see Tables 3.6-23, 3.6-24, and 3.6-25 in Section 3.6). The potential effects of cable heat to the availability of turtle forage would be **negligible** adverse under Alternative G. Project EMF effects would combine with those generated by the 13,469 miles of new and existing transmission cables from the other new OSW facilities planned on the Mid-Atlantic OCS as well as other existing transmission cables. This represents an extremely small percentage of the GAA for sea turtles and is unlikely to lead to biologically significant effects on sea turtle movement, migration, or foraging patterns. Therefore, the cumulative impacts associated with Alternative G when combined with past, present, and reasonably foreseeable activities would represent a long-term **negligible** adverse impact on sea turtles.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				for RWEC cable segments lying on the bed surface. This indicates that turtles would only be able to detect induced magnetic fields within a few feet of cable segments lying on the bed surface. These cable segments would be relatively short (less than 100 feet long) and widely dispersed. Exponent (2023) concluded that the shielding provided by burial and the grounded metallic sheaths around the cables would effectively eliminate any induced electrical field effects detectable to turtles. Given the limited extent of measurable magnetic field levels and limited potential for mobile species like sea turtles to encounter field levels above detectable thresholds, the effects of Project-related EMF exposure on sea turtles would be **negligible** adverse for the life of the Project for the Proposed Action. Alternatives C through F would result in similar EMF impacts to those described for the Proposed Action, but those impacts would be reduced in extent and the total area exposed would vary depending on the alternative and configuration selected (see Tables 3.6-23, 3.6-24, and 3.6-25 in Section 3.6). Heat from the buried RWEC and IACs could affect some benthic organisms that represent forage for turtles, but little is known about the potential change to substrate temperatures that transmission cables might have on the benthos (Taormina et al. 2018). Benthic effects are not expected to impact leatherback turtles as benthic prey are not typically included in their diet. Effects to algal cover (green sea turtle forage) and crustaceans, gastropods, crabs, and bivalves (loggerhead sea turtle forage) could conceivably affect sea turtle foraging opportunities. However, because cables would be buried to a depth of 4 to 6 feet and/or covered with concrete protection, changes in temperature of the substrate at the surface of the seafloor is not anticipated to increase markedly. The potential effects of cable heat to the availability of turtle forage would be **negligible** adverse under the Proposed Action and Alternatives C through F. Project EMF effects would combine with those generated by the 10,024 miles of new and existing transmission cables from the other new OSW facilities planned on the Mid-Atlantic OCS	

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				as well as other existing transmission cables. Submarine power cables would be installed with appropriate shielding and at a burial depth to reduce potential EMF at the substrate surface. The RWEC and IACs would maintain a minimum separation of at least several hundred feet from other known cables to avoid inadvertent damage during installation and additive EMF effects from adjacent cables (CSRIC 2014; Sharples 2011; TÜV SÜD PMSS 2014). Additionally, exposure to detectable levels of EMF would be limited to within 25 feet of the small number of areas where cable segments cannot be buried to the anticipated depth. This represents an extremely small percentage of the GAA for sea turtles and is unlikely to lead to biologically significant effects on sea turtle movement, migration, or foraging patterns. Therefore, the cumulative impacts associated with the Proposed Action and Alternatives C through F when combined with past, present, and reasonably foreseeable activities would represent a long-term **negligible** adverse impact on sea turtles.	
Light: Vessels	Constructed and permitted OSW COP projects are introducing 83 lighted structures into the GAA, as well as lighted 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, 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-OSW activities produce temporary and localized light sources that could result in the attraction or avoidance behavior of sea turtles. These short-term impacts are expected to be of low intensity and occur infrequently.	**Offshore:** Nighttime lighting associated with offshore structures and vessels could represent a source of attraction, avoidance, or other behavioral responses in sea turtles. Although responses to light have been studied in various species and life stages of sea turtles in nesting beach environments, the effects of offshore lighting remain uncertain. Shoreline development is the predominant existing artificial lighting source in the nearshore component of the GAA, whereas vessels, mainly fishing vessels, are the predominant artificial lighting source offshore. Future wind energy development would contribute additional light sources to the offshore component of the GAA, including a temporary increase in light from vessels used during construction and the long-term use of navigational lighting on new WTGs and OSSs. An estimated 3,088 foundations are forecasted for future wind energy construction. Each structure would have minimal white flashing navigational lighting as well as red flashing FAA hazard lights in accordance with BOEM's (2021)	**Offshore:** Lights would be required on vessels and heavy equipment during construction. Most scientific studies on lighting effects on sea turtles were conducted at nesting sites, which do not occur in the RWF and RWEC. Gless et al. (2008) reported that previous studies showed that loggerhead turtles were attracted to lights from longline fishing vessels. Gless et al. (2008) conducted a laboratory study to see if juvenile leatherbacks responded to lights in the same way as loggerheads. Their study showed that leatherbacks either failed to orient or oriented at an angle away from the lights and concluded that there is no convincing evidence that marine turtles are attracted to vessel lights. Limpus (2006) indicates that navigation/anchor lights on top of vessel masts are not impactful but that bright deck lights should be shielded if possible to reduce impacts to sea turtles. Project EPMs (see Table F-1 in Appendix F) stipulate that construction vessel lightingwould be limited to the minimum necessary to ensure safety and to comply with applicable regulations. Additionally, BOEM (2021) has	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, temporary construction lighting and operational lighting effects on sea turtles would be **negligible** adverse. BOEM estimates a cumulative total of 3,155 offshore WTGs and OSS foundations for Alternative G plus all other future OSW projects in the GAA. All future wind farm projects would be expected to follow BOEM design guidance for lighting of offshore structures and avoiding and minimizing artificial lighting impacts from offshore energy facilities and associated construction vessels (BOEM 2021; Orr et al. 2013). Adherence to these measures should effectively avoid adverse effects on aquatic organisms. BOEM would require all future offshore energy projects to comply with this guidance.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
			lighting and marking guidelines. Although the potential effects of offshore lighting on juvenile and adult sea turtles is uncertain, WTG lighting is anticipated to have a **negligible** adverse effect on sea turtles based on the lack of observed effects on sea turtles from decades of oil and gas platform operations in the Gulf of Mexico, which can have considerably more lighting than offshore WTGs (BOEM 2021).	issued design guidance for avoiding and minimizing artificial lighting impacts from offshore energy facilities and associated construction vessels and has concluded that adherence to these measures should effectively avoid adverse effects on sea turtles. Considering the EPMs and the fact that construction vessel activity is unlikely to measurably alter baseline vessel light levels, temporary construction lighting effects on sea turtles would be **negligible** adverse. The RWF would include a variety of operational lighting, including navigational lighting for mariners, obstruction lighting for aviators, and vessel/work lighting for O&M (BOEM 2021). Orr et al. (2013) indicated that lights on wind generators flash intermittently for navigation or safety purposes and do not present a continuous light source. Limpus (2006) suggested that intermittent flashing lights with a very short "on" pulse and long "off" interval are nondisruptive to marine turtle behavior, irrespective of the color. Limpus (2006) also indicated that navigation/anchor lights on top of vessel masts are unlikely to adversely affect sea turtles but that bright deck lights should be shielded if possible to reduce impacts to sea turtles. Sea turtles' typical behavior of remaining predominantly submerged would additionally limit the exposure of individuals to operational lighting. BOEM (2021) has issued design guidance for avoiding and minimizing artificial lighting impacts from offshore energy facilities and has concluded that adherence to these measures should effectively avoid adverse effects on fish. RWF adherence to design guidelines would ensure operational lighting effects on sea turtles would be minimal, temporary, and therefore **negligible** adverse. The Proposed Action would result in negligible incremental impacts to sea turtles through the installation of 102 lighted structures (100 WTGs and two OSSs). This represents approximately 3% of the projected increase in offshore lighting projected under the No Action Alternative. BOEM estimates a cumulative total of 3,110 offshore WTGs and OSS foundations for the Proposed Action plus all other future OSW	Nighttime lighting associated with offshore structures and vessels could represent a source of attraction, avoidance, or other behavioral responses in sea turtles. However, BOEM assumes that all OSW projects would be sited offshore, away from nesting beaches, and would not disorient nesting females or hatchling sea turtles. Because other planned and potential future OSW energy projects would be expected to adhere to the same measures to avoid adverse lighting impacts, Alternative G when combined with past, present, and reasonably foreseeable activities would also represent a **negligible** adverse cumulative impact on sea turtles.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				projects in the GAA. All future wind farm projects would be expected to follow BOEM design guidance for lighting of offshore structures and avoiding and minimizing artificial lighting impacts from offshore energy facilities and associated construction vessels (BOEM 2021; Orr et al. 2013). Adherence to these measures should effectively avoid adverse effects on aquatic organisms. BOEM would require all future offshore energy projects to comply with this guidance. Nighttime lighting associated with offshore structures and vessels could represent a source of attraction, avoidance, or other behavioral responses in sea turtles. However, BOEM assumes that all OSW projects would be sited offshore, away from nesting beaches, and would not disorient nesting females or hatchling sea turtles. Because other planned and potential future OSW energy projects would be expected to adhere to the same measures to avoid adverse lighting impacts, the Proposed Action when combined with past, present, and reasonably foreseeable activities would also represent a **negligible** adverse cumulative impact on sea turtles. Alternatives C through F would include the same, or similar, extent of light emissions as those described for the Proposed Action but would be reduced based on the reduction in the number of WTGs and other operational lighting elements, resulting in a **negligible** adverse impact. Project lighting represents no more than a 3% projected increase in offshore lighting compared to the No Action Alternative. BOEM estimates a cumulative total of 3,066 to 3,103 offshore WTGs and OSS foundations for Alternatives C through F plus all other future OSW projects in the GAA. Thus, the impacts of operational lighting are also considered **negligible** adverse.	
Light: Structures	Constructed and permitted OSW COP projects are introducing 83 lighted structures into the GAA. 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.	Non-OSW activities would not be expected to appreciably contribute to this sub-IPF. As such, no impact on sea turtles would be expected.	See Light: Vessels above for offshore and onshore analysis.	See Light: Vessels above for offshore and onshore analysis.	See Light: Vessels above for offshore and onshore analysis.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	Decades of oil and gas platform operations 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 2021).				
New cable emplacement/ maintenance	Constructed and permitted OSW COP projects are introducing an estimated 498 miles of new offshore cable in the GAA. This and other non-OSW cable maintenance activities can disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances would be local 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 could cause individuals to alter normal movements and behaviors. However, these changes are expected to be too small to be detected (NOAA 2020b). 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 2020b). Turbidity associated with increased sedimentation could result in short-term, temporary impacts on sea turtle prey species (see Table E2-4).	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. 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 could result in short-term, temporary impacts on some sea turtle prey species (see Table E2-4).	See Anchoring above for offshore and onshore analysis.	See Anchoring above for offshore and onshore analysis.	See Anchoring above for offshore and onshore analysis.
Noise: Aircraft	Aircraft routinely travel in the GAA 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 could respond with a startle response (diving or swimming 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.	Future low-altitude aircraft activities such as surveys 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 could respond with a startle response (diving or swimming 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.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1. Table 3.19-2 for analysis.
Noise: G&G	Noise from G&G surveys associated with permitted OSW COP projects may occur in the GAA. 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	Same as ongoing activities, with the addition of possible future oil and gas exploration surveys.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	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 using 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.				
Noise: HRG	Noise from HRG surveys associated with permitted OSW COP projects may occur in the GAA. Possibly included in site characterization surveys and scientific surveys are high-resolution geophysical (HRG) surveys. HRG surveys could be conducted using one or two air guns as the acoustic source, but they generally use electromechanical sources such as side-scan sonars, shallow- and medium-penetration sub-bottom profilers, and single- or multibeam echosounders. Non-air un HRG sources are often used in combination in order to acquire necessary data during a single deployment. HRG surveys are sometimes conducted using autonomous underwater vehicles equipped with multiple acoustic sources (NMFS 2018b). HRG surveys are typically on a time scale of weeks and higher frequency HRG survey noise resulting from cable route surveys could be less intense than G&G noise from site investigation surveys in WEAs. Impacts include 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). These impacts would be negligible as turtles would be expected to avoid 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.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Noise: Turbines	Noise from turbine operation associated with permitted and built OSW COP projects occurs in the GAA. Available evidence suggests that typical underwater noise levels from operating WTGs would be below current cumulative injury and behavioral effect thresholds for sea turtles. Operating turbines were determined to produce	This sub-IPF does not apply to future non-OSW development.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1 Table 3.19-2 for analysis.	See Sections 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	underwater noise on the order of 110 to 125 dB_{RMS}, occasionally reaching as high as 128 dB_{RMS} in the 10-Hz to 8-kHz range (Tougaard et al. 2020). As measured at the BIWF, low-frequency operational noise barely exceeds ambient levels at 164 feet (50 m) from the WTG base (Miller and Potty 2017). Operational noise impacts would be expected to be negligible.				
Noise: Pile driving	Noise from pile driving associated with permitted OSW COP projects is occurring during installation of foundations for offshore structures. Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seafloor can result in high-intensity, low-exposure levels 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 to turtles: Potential mortal injury: 210 dB cumulative SPL or greater than 207 dB_{PEAK} SPL (Popper et al. 2014) Potential mortal injury: 204 dB_{SEL}, 232 dB_{PEAK} (PTS), 189 dB_{SEL}, 226 dB_{PEAK} (TTS) (Navy 2017) Behavioral harassment: 175 dB referenced to 1 μPa rms (Navy 2017)	No future activities were identified within the GAA for sea turtles other than ongoing activities.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Noise: Cable laying/trenching	N/A	Cable laying impacts resulting from future non-OSW activities would be identical to those described for future OSW projects.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Noise: Vessels	Ongoing OSW and non-OSW activities that contribute to this sub-IPF include permitted and built OSW COP projects, commercial shipping, recreational, and fishing vessels; scientific and academic research vessels; and other construction 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	See Section 3.16. Any offshore projects that require the use of ocean vessels could 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	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	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 could respond to vessel approach and/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.	al. 2005). However, BOEM expects that these brief responses of individuals to passing vessels would be unlikely given the patchy distribution of sea turtles, and no stock or population-level effects would be expected.			
Port utilization: Expansion	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing 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 could affect sea turtles, but response would be expected to be short- term and temporary (see the Vessels: Noise sub-IPF above). The impact on water quality from sediment suspension during port expansion activities is short term, temporary, and would be similar to those described under the New cable emplacement/maintenance IPF above.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity would increase modestly. The ability of ports to receive the increase in larger ships would require port modifications. Future channel-deepening activities are being undertaken to accommodate deeper draft vessels for the Panama Canal locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and could 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).	The development of an OSW industry on the Mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Port improvements could lead to an increase in vessel traffic during construction (see Section 3.16), O&M, and decommissioning. The resulting change in vessel traffic in the GAA cannot be predicted because, while some ports have been identified as possibilities for expansion, no specific project plans have been proposed. Therefore, impacts would be **negligible** adverse. Any future port expansion and associated increase in vessel traffic would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential effects on sea turtles regionwide.	**Offshore:** Several regional ports could be used during Project construction, including ports in Baltimore, MD; New Bedford, MA; New London, CT; Norfolk, VA; Paulsboro, NJ; and Providence, RI, as well as Europe. The development of an OSW industry on the Mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects, but no specific improvements are included in the Proposed Action and Alternatives C through F. Therefore, impacts would be **negligible** adverse. Any future port expansion would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential environmental effects. Future actions, should they occur, could involve activities like dredging and the expansion or development of new structures that could lead to adverse effects on coastal and estuarine habitats used by sea turtles and their prey species. These projects could result in cumulative effects on sea turtles, but the extent and significance of these effects cannot be evaluated because no project proposals have been developed. Therefore, impacts would be **negligible** adverse. However, the environmental effects resulting from any future port expansions would be evaluated in independent NEPA analysis, ESA compliance documents, and other regulatory approvals for each project.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, impacts would be **negligible** adverse. Any future port expansion would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential environmental effects.
				Onshore: Onshore Project activities would not result in impacts to marine resources regardless of alternative. Therefore, onshore activities and facilities would have no measurable effect on sea turtles and would therefore be **negligible** adverse.	**Onshore:** Onshore Project activities would not result in impacts to marine resources regardless of alternative. Therefore, onshore activities and facilities would have no measurable effect on sea turtles and would therefore be **negligible** adverse.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Presence of structures: Entanglement or ingestion of lost fishing gear	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. The Mid-Atlantic region also has more than 130 artificial reefs. Currently, bridge foundations and the BIWF could be considered artificial reefs and could 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 GAA 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 GAA for sea turtles other than ongoing activities.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Presence of structures: Habitat conversion and prey aggregation	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. The Mid-Atlantic region also has more than 130 artificial reefs. Hard-bottom (scour control and rock mattresses) and vertical structures (bridge foundations and BIWF WTGs) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (NMFS 2015; Taormina et al. 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 sea turtles compared to the surrounding soft bottoms.	The presence of structures associated with non-OSW development in nearshore coastal waters has the potential to provide habitat for sea turtles as well as preferred prey species. This reef effect has the potential to result in long-term, low-intensity beneficial impacts. Bridge foundations would continue to provide foraging opportunities for sea turtles, with measurable benefits to some individuals.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Presence of structures: Avoidance/Displacement	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. Given that sea turtles are highly mobile and the structures are only 36 to 45 feet in diameter and would be separated by approximately 1 mile, the structural alterations of the water column are unlikely to pose a direct barrier to foraging, migration, or other behaviors of sea turtles.	Not contemplated for non-OSW facility sources.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Presence of structures: Behavioral disruption (breeding and migration)	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. Given that sea turtles are highly mobile and the structures are only 36 to 45 feet in diameter and would be separated by approximately 1 mile, the structural alterations of the water column are unlikely to	Not contemplated for non-OSW facility sources.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.

Associated IPF: Sub-IPFs	**Ongoing Activities***	**Future Non–Offshore Wind Activities Intensity/Extent**	**Future Offshore Wind Activities Intensity/Extent**	**Proposed Action and Alternatives C through F**	**Alternative G (Preferred Alternative)**
	pose a direct barrier to foraging, migration, or other behaviors of sea turtles.				
Presence of structures: Displacement into higher risk areas (vessels and fishing)	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. Given that sea turtles are highly mobile and the structures are only 36 to 45 feet in diameter and would be separated by approximately 1 mile, the structural alterations of the water column are unlikely to pose a direct barrier to foraging, migration, or other behaviors of sea turtles.	Not contemplated for non-OSW facility sources.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Sediment deposition and burial	Ongoing sediment dredging for navigation purposes results in fine sediment deposition. Installation of permitted OSW COP projects can also result in fine sediment deposition. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local and limited to the emplacement corridor. Data are not available regarding effects of suspended sediments on adult and juvenile sea turtles, although elevated suspended sediments could cause individuals to alter normal movements and behaviors. However, these changes are expected to be too small to be detected (NOAA 2020b). 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 2020b). Turbidity associated with increased sedimentation could result in short-term, temporary impacts on sea turtle prey species.	The impact on water quality from 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 could result in short-term, temporary impacts on some sea turtle prey species.	As previously noted, up to 13,469 miles of cable would be added in the GAA. Cable placement and other related construction activities would disturb the seafloor, creating plumes of fine sediment that would disperse and resettle in the vicinity. Data are not available regarding impacts of suspended sediments on adult and juvenile sea turtles, although elevated suspended sediments could cause individuals to alter normal movements and behaviors. However, these changes would be limited in extent, short term in duration, and likely too small to be detected (NOAA 2020b). Seafloor disturbance during construction of future OSW projects could affect foraging success for some prey species; however, given that impacts would be short term and generally localized to the cable corridor, no population-level effects on sea turtles would be expected. Overall, anticipated effects from sediment deposition and burial on sea turtles would be **negligible** adverse.	**Offshore:** Construction of the RWF and offshore RWEC is expected to result in elevated levels of suspended sediment in the immediate proximity of bed-disturbing activities like pile driving, placement of scour protection, and trenching and burial of the RWEC and IAC. The majority of water column effects would be limited to short-term TSS pulses below 100 mg/L. Higher TSS concentrations exceeding 100 mg/L would occur in areas where seafloor sediments have a greater proportion of mud and silt. TSS plumes caused by construction disturbance would dissipate quickly, with concentrations above 100 mg/L lasting no longer than 6 hours at any location (RPS 2022). A summary of the anticipated extent of water column TSS and substrate burial effects is provided in Section 3.6. These effects would be short term because TSS levels are predicted to return to normal within minutes to hours of activity completion, depending on the magnitude of disturbance and sediments disturbed. Direct physical effects from TSS exposure are unlikely because sea turtles breathe air and do not share the physiological sensitivities of susceptible organisms like fish and invertebrates. Turtles could alter their behavior in response to elevated suspended sediment levels (e.g., moving away from an affected area). They could also experience behavioral stressors (e.g., reduced ability to forage and avoid predators). However, turtles are highly mobile and can avoid short-term suspended sediment impacts that are limited in severity and range. Given the anticipated extent of potential suspended sediment impacts expected to result from the Project, sea turtle	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, effects to sea turtles from elevated suspended sediment levels would be **negligible** adverse. Alternative G would result in similar impacts to sediment deposition and burial to the Proposed Action but reduced in extent and therefore **negligible**. Many sea turtle species routinely inhabit nearshore and estuarine environments with periodically high natural turbidity levels; therefore, short-term exposure to elevated suspended sediment is unlikely to measurably inhibit foraging (Michel et al. 2013). As discussed in Section 3.6, habitat disturbance and resettled sediment are natural ecosystem processes, and impacts on prey and foraging success for sea turtles would also be **negligible** adverse for Alternative G. Sediment deposition and burial effects on sea turtles resulting from Alternative G Project O&M and decommissioning would be temporary **negligible** adverse. BOEM estimates a cumulative total of up to 104,781 acres of seafloor disturbance for the Alternative G plus all other future OSW projects in the GAA. Alternative G would result in impacts similar to the Proposed Action, but the magnitude of those impacts would be reduced based on the smaller footprint proposed for this

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				mobility to avoid exposure, and low sea turtle sensitivity to this stressor, effects to sea turtles from elevated suspended sediment levels would be **negligible** adverse. Alternatives C through F would result in similar impacts to sediment deposition and burial to the Proposed Action but reduced in extent and therefore **negligible**. Many sea turtle species routinely inhabit nearshore and estuarine environments with periodically high natural turbidity levels; therefore, short-term exposure to elevated suspended sediment is unlikely to measurably inhibit foraging (Michel et al. 2013). As discussed in Section 3.6, habitat disturbance and resettled sediment are natural ecosystem processes, and impacts on prey and foraging success for sea turtles would also be **negligible** adverse for the Proposed Action and Alternatives C through F. Seafloor disturbance during O&M activities would be limited. As noted previously, the cables are unlikely to require repair or maintenance, but up to 10% of cable protection could need to be replaced over the life of the Project. Replacement of the cable protection could result in localized, temporary increases in TSS. However, consistent with impacts of cable installation, suspended sediment plumes would be limited to within 10 to 12 feet of the seafloor in the open ocean waters where marine mammals are most likely to occur. Potential effects of removal of the cable during decommissioning would be similar in nature to those anticipated for cable installation or replacement of cable protection. Those species that are exposed to elevated TSS would be unlikely to experience measurable effects on behavior, foraging success, or mobility. Sediment deposition and burial effects on sea turtles resulting from the Proposed Action and Alternatives C through F Project O&M and decommissioning would be temporary **negligible** adverse. BOEM estimates a cumulative total of up to 30,885 acres of seafloor disturbance for the Proposed Action plus all other future OSW projects in the GAA. Alternatives C through F would result in impacts similar to the Proposed Action, but the magnitude of those impacts would be reduced based on the smaller	alternative. As discussed earlier, TSS effects on sea turtles are likely to be negligible adverse because of limited potential exposure to elevated TSS. No population-level effects on sea turtles are expected from reduced water quality. Therefore, Alternative G when combined with past, present, and reasonably foreseeable activities would result in **negligible** adverse cumulative effects on sea turtles.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				footprint proposed for these alternatives. As discussed above, TSS effects on sea turtles are likely to be negligible adverse because of limited potential exposure to elevated TSS. No population-level effects on sea turtles are expected from reduced water quality. Therefore, the Proposed Action and Alternatives C through F when combined with past, present, and reasonably foreseeable activities would result in **negligible** adverse cumulative effects on sea turtles.	
Traffic: Vessel collisions	Current OSW and non-OSW activities contributing to this sub-IPF include permitted and built OSW COP projects, port traffic levels, fairways, traffic separation schemes, 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 that were 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 could 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-OSW development has the potential to result in an increased collision risk. While these impacts would be high consequence, the patchy distribution of sea turtles makes stock or population-level effects unlikely (Navy 2018).	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Climate change: Warming and sea level rise, storm severity/frequency	Increased storm frequency could lead to long-term, high-consequence impacts on sea turtle onshore beach nesting habitat, including changes to nesting periods, changes in sex ratios of nestlings, and drowned nests as well as loss or degradation of nesting beaches. Offshore impacts, including sedimentation of nearshore hard-bottom habitats, have the potential to result in long-term, high-consequence changes to foraging habitat availability for green turtles.	No future activities were identified within the GAA for sea turtles other than ongoing activities.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Climate change: Ocean acidification	This sub-IPF has the potential to lead to long-term, high-consequence impacts on marine ecosystems by contributing to reduced growth	No future activities were identified within the GAA for sea turtles other than ongoing activities.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	or the decline of invertebrates that have calcareous shells.				
Climate change: Warming and sea level rise, altered habitat/ecology	This sub-IPF has the potential to lead to long-term, high-consequence impacts on sea turtles by influencing distributions of sea turtles and/or prey resources. This sub-IPF has the potential to lead to long-term, high-consequence impacts on sea turtle breeding, foraging, and sheltering habitat use.	No future activities were identified within the GAA for sea turtles other than ongoing activities.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Climate change: Warming and sea level rise, altered migration patterns	This sub-IPF has the potential to lead to long-term, high-consequence impacts on sea turtle habitat use and migratory patterns.	No future activities were identified within the GAA for sea turtles other than ongoing activities.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Climate change: Warming and sea level rise, disease frequency	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the frequencies of various diseases of sea turtles such as fibropapillomatosis.	No future activities were identified within the GAA for sea turtles other than ongoing activities.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Climate change: Warming and sea level rise, protective measures (barriers, sea walls)	The proliferation of coastline protections have the potential to result in long-term, high-consequence impacts on sea turtle nesting by eliminating or precluding access to potentially suitable nesting habitat or access to potentially suitable habitat.	No future activities were identified within the GAA for sea turtles other than ongoing activities.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.
Climate change: Warming and sea level rise; storm severity, frequency, sediment erosion, deposition	Sediment erosion and/or deposition in coastal waters has the potential to result in long-term, high-consequence impacts on green sea turtle foraging habitat. Additionally, sediment erosion has the potential to result in the degradation or loss of potentially suitable nesting habitat.	No future activities were identified within the GAA for sea turtles other than ongoing activities.	See Section 3.19.2.2.2 for analysis.	See Sections 3.19.2.3 and 3.19.2.4 and Section 3.19.2.1, Table 3.19-2 for analysis.	See Section 3.19.2.5 and Section 3.19.2.1, Table 3.19-2 for analysis.

* Includes all constructed and permitted COP projects within the sea turtles GAA: Block Island, SFWF, Vineyard Wind 1, and Coastal Virginia Offshore Wind.

Demographics, Employment, and Economics

Table E2-7. Summary of Activities and the Associated Impact-Producing Factors for Demographics, Employment, and Economics

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Energy generation/ security	Constructed and permitted OSW COP projects are slated to provide up to 972 MW of power. In 2017, Massachusetts energy production totaled 125.2 trillion British thermal units (Btu), of which 72.4 trillion Btu was from renewable sources, including geothermal,	Ongoing development of onshore solar and wind energy would provide diversified, small-scale energy generation. State and regional energy markets would require additional peaker plants and energy storage to meet the electricity needs when utility scale renewables are not producing.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	hydroelectric, wind, solar, and biomass (U.S. Energy Information Administration 2018). In 2019, Rhode Island energy production totaled 8.8 trillion Btu from renewable resources, including biofuels, wood and waste, and noncombustible renewables. In the same year, Connecticut energy production totaled 211.9 trillion Btu, of which 37.2 trillion Btu was from renewable sources (U.S. Energy Information Administration 2021).				
Light: Structures	Constructed and permitted OSW COP projects are introducing 83 lighted structures into the GAA. Offshore buoys and towers also emit low-intensity light, while onshore structures, including houses and ports, emit substantially more light on an ongoing basis. These light sources may be visible at night and could impact employment and economic activity in the tourism industry by affecting the decisions of tourists in selecting coastal locations to visit.	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.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.
Light: Vessels	OSW and non-OSW ocean vessels have an array of lights, including navigational lights and deck lights. These light sources may be visible at night and could impact employment and economic activity in the tourism industry by affecting the decisions of tourists in selecting coastal locations to visit.	Anticipated modest growth in vessel traffic would result in some growth in the nighttime traffic of vessels with lighting.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.
New cable emplacement/ maintenance	Constructed and permitted OSW COP projects are introducing an estimated 498 miles of new offshore cable in the GAA. This and other non-OSW cable maintenance activities can disturb the seafloor and cause temporary increases in suspended sediment; these disturbances could cause a disruption to commercial fishing or for-hire recreational fishing businesses but would be limited to emplacement corridors. In the GAA for demographics, employment, and economics there are six existing power cables.	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. 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.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.
Port utilization: Expansion	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The	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 be able to host larger deep draft vessels as they continue to increase in size.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	New Bedford Marine Commerce Terminal was upgraded by the port specifically to support the construction of OSW energy facilities.				
Port utilization: Maintenance/ Dredging	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities 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 be able to host larger deep draft vessels as they continue to increase in size.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.
Presence of structures: Allisions	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. 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. To the extent that the impacts of future OSW activities result in declines in the economic performance of commercial and for-hire recreational fisheries, workers employed in these fisheries, including fishing vessel crewmembers and seafood processor workers, could be adversely affected. However, WTG spacing and orientation measures, together with the ability of fishing vessel operators to adjust transit and fishing locations to avoid conflicts with construction related to OSW energy development, would help ensure that fishing businesses could continue to operate with minimal disruption.	Vessel allisions with non-OSW stationary objects should not increase meaningfully without a substantial increase in vessel congestion.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.
Presence of structures: Entanglement, gear loss, gear damage	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. 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–OSW) would not result in additional offshore structures.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.
Presence of structures: Fish aggregation	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. 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 could be known as fish	Reasonably foreseeable activities (non–OSW) would not result in additional offshore structures.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	aggregating devices (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.				
Presence of structures: Habitat conversion	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. 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. Structure-oriented fishes are attracted to these locations, which could 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–OSW) would not result in additional offshore structures.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.
Presence of structures: Navigation hazard	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. 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. To the extent that the impacts of future OSW activities result in declines in the economic performance of commercial and for-hire recreational fisheries, workers employed in these fisheries, including fishing vessel crewmembers and seafood processor workers, could be adversely affected. However, WTG spacing and orientation measures, together with the ability of fishing vessel operators to adjust transit and fishing locations to avoid conflicts with construction related to OSW energy development, would help ensure that fishing businesses could continue to operate with minimal disruption.	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.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.
Presence of structures: Space use conflicts	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. To the extent that the impacts of future OSW activities result in declines in the economic performance of commercial and for-hire recreational fisheries, workers employed in these fisheries, including fishing vessel	Reasonably foreseeable activities (non–OSW) would not result in additional offshore structures.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	crewmembers and seafood processor workers, could be adversely affected. However, WTG spacing and orientation measures, together with the ability of fishing vessel operators to adjust transit and fishing locations to avoid conflicts with construction related to OSW energy development, would help ensure that fishing businesses could continue to operate with minimal disruption.				
Presence of structures: Viewshed	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. These structures are visible from certain views and could impact employment and economic activity in the tourism industry by affecting the decisions of tourists in selecting coastal locations to visit.	Reasonably foreseeable activities (non–OSW) would not result in additional offshore structures.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.
Traffic: Vessels	Constructed and permitted OSW COP projects are using vessels to support construction and O&M activities. Ports and marine traffic related to shipping, fishing, and recreation are important to the region's economy. Vessel traffic related to OSW energy project construction can cause congestion and delays, thereby increasing vessel fuel costs (i.e., for vessels forced to wait for port traffic to pass) and decreasing productivity for commercial shipping businesses.	New vessel traffic near the GAA 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 economy.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.
Traffic: Vessel collisions	The region's substantial OSW and non-OSW marine traffic could 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.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.
Traffic: Vehicle	Onshore OSW and non-OSW development activities support local population growth, employment, and economies. Disturbances can cause temporary, localized traffic delays and restricted access to adjacent properties.	Onshore development projects would be ongoing in accordance with local government land use plans and regulations.	See Section 3.11.2.2.2 for analysis.	See Sections 3.11.2.3 and 3.11.2.4 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.	See Section 3.11.2.5 and Section 3.11.2.1, Table 3.11-5 for analysis of impacts.
Climate change	Climate models predict climate change if current trends continue. Climate change has adverse implications for demographics and the economic health of coastal communities, due in part to the costs of resultant damage to property and infrastructure, fisheries and other natural resources, increased disease frequency, and sedimentation, among other factors.	Onshore projects that reduce air emissions could contribute to the effort to limit climate change. Onshore solar and wind energy projects, although producing less energy than potential OSW developments, would also provide incremental reductions.	Because future OSW energy facilities would produce less GHG emissions than fossil fuel–combusting power generation facilities with similar capacities, these facilities would reduce the adverse effects of climate change on the demographic and economic health of coastal communities in the GAA. These beneficial impacts would be long term, but they would be **negligible** adverse given the magnitude of global GHG emissions and their adverse	During operations, the Proposed Action would have a beneficial impact to demographic, employment, or economic conditions in the GAA by contributing to a broader combination of actions to reduce future impacts from climate change over the long term. These beneficial impacts would be long term, but they would be **negligible** adverse given the magnitude of global GHG emissions and their adverse demographic,	Similar impacts to the Proposed Action and Alternatives C through F: long term beneficial **negligible** during operations and cumulatively long term **major** adverse for all design configurations analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
			demographic, employment, and economic impacts.	employment, and economic impacts for all design configurations analyzed under the Proposed Action. Collectively, the Proposed Action when combined with past, present, and reasonably foreseeable projects would have long-term **major** adverse impacts on demographic, employment, and economic conditions in the GAA, primarily through the associated risks of flooding, extreme heat, and storm damage. Alternatives C through F would be similar to that for the Proposed Action: long term beneficial **negligible** during operations and cumulatively long term **major** adverse for all design configurations analyzed.	

* Includes all constructed and permitted COP projects within the demographics, employment, and economics GAA: Block Island, SFWF, Vineyard Wind 1, and Coastal Virginia Offshore Wind.

Environmental Justice

No IPFs with solely negligible impacts were identified.

Table E2-8. Summary of Activities and the Associated Impact-Producing Factors for Environmental Justice

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Fuel/fluids/hazmat	Constructed and permitted OSW COP projects can accidentally release an estimated 900,000 gallons of fuel, oils, or other hazardous materials in the GAA. Accidental releases of fuels and fluids occur during vessel usage for dredge material ocean disposal; fisheries use; marine transportation; military use; survey activities; and cable, line, and pipeline laying. According to the 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 (2021), 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 < 70,000 barrels. Impacts on water quality would be expected to brief and	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue a similar trend to ongoing uses. Impacts are unlikely to affect water quality.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	localized from accidental releases. All vessels would comply with USCG requirements and BSEE regulations for the prevention and control of oil and fuel spills.				
Discharges	Discharges impact water quality by introducing nutrients, chemicals, and sediments to the water. Constructed and permitted OSW COP projects can potentially generate operational waste, including bilge and ballast water, sanitary and domestic wastes, and trash and debris in the GAA. There are regulatory requirements related to prevention and control of discharges, the prevention and control of accidental spills, and the prevention and control of 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 the EPA has established dredge spoil criteria and regulates the disposal permits issued by the USACE. The impact on water quality from sediment suspension during these future activities would be short term and localized.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.
Air emissions: Construction/ Decommissioning	Ongoing population growth and new development within the GAA is likely to increase traffic, with a resulting increase in emissions from motor vehicles. Some new industrial development could result in emissions-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. Construction of permitted OSW projects in the GAA is estimated to generate 124,277 tons of NO_X, 2,684 tons of SO_2, 5,795 tons of PM_{10}, and 7,709,706 metric tons of CO_2e. Operation of permitted and built OSW projects in the GAA is estimated to generate 2,940 tons of NO_X, 44 tons of SO_2, 110 tons of PM_{10}, and 700,114 metric tons of CO_2e. These volumes represent a negligible increase to county emissions; additionally, only a portion of the generated emissions would actually reach nearby counties and would depend on wind conditions at the time the emissions are generated.	New development could include emissions-producing industry and new development that would increase emissions from motor vehicles. Some historically industrial waterfront locations would continue to lose industrial uses, with no new industrial development to replace it. Cities such as New Bedford are promoting start-up space and commercial uses to reuse industrial space.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.
Air emissions: O&M	Ongoing population growth and new development within the GAA is likely to increase traffic, with a resulting increase in emissions from motor vehicles. Some new industrial development could result in emissions-producing uses. At the same time, many industrial waterfront areas near	New development could include emissions-producing industry and new development that would increase emissions from motor vehicles. Some historically industrial waterfront locations would continue to lose industrial uses, with no new industrial development to replace it. Cities such as New	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	environmental justice communities are losing industrial uses and converting to more commercial or residential uses. For permitted OSW projects in the GAA, see Air emissions: construction/ decommissioning.	Bedford are promoting start-up space and commercial uses to reuse industrial space.			
Light: Structures	Constructed and permitted OSW COP projects are introducing 83 lighted structures into the GAA. Offshore buoys and towers also emit low-intensity light, while onshore structures, including houses and ports, emit substantially more light on an ongoing basis. These light sources may be visible at night and could impact employment and economic activity in the tourism industry by affecting the decisions of tourists in selecting coastal locations to visit.	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.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.
New cable emplacement/maintenance	Constructed and permitted OSW COP projects are introducing an estimated 498 miles of new offshore cable in the GAA. This and other non-OSW cable maintenance activities can disturb the seafloor and cause temporary increases in suspended sediment; these disturbances could cause a disruption to commercial fishing or for-hire recreational fishing businesses but would be limited to emplacement corridors.	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. Future new cables would disturb the seafloor and cause temporary increases in suspended sediment, resulting in infrequent, localized, and short-term impacts over the next 35 years.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.
Noise: O&M	Offshore O&M of constructed and permitted OSW COP projects generates negligible amounts of noise.	There are no reasonably foreseeable offshore facilities that would generate noise from O&M.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.
Noise: Pile driving	Noise from pile driving associated with permitted OSW COP projects is occurring during installation of foundations for offshore structures. Noise from pile driving also occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area.	No future activities were identified within the GAA other than ongoing activities.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.
Noise: Trenching	Noise from trenching/cable laying associated with permitted OSW COP projects may occur in the GAA. Infrequent trenching for other pipeline and cable laying activities also emits noise. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise are typically less prominent	Periodic trenching would be needed over the next 35 years for repair or new installation of underground infrastructure.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	than the impacts of the physical disturbance and sediment suspension.				
Noise: Vessels	OSW and non-OSW Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF consist of permitted and built OSW COP projects, 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.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.
Presence of structures: Entanglement, gear loss/damage	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. 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–OSW) would not result in additional offshore structures.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.
Presence of structures: Navigation hazard	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. 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. To the extent that the impacts of future OSW activities result in declines in the economic performance of commercial and for-hire recreational fisheries, workers employed in these fisheries, including fishing vessel crewmembers and seafood processor workers, could be adversely affected. However, WTG spacing and orientation measures, together with the ability of fishing vessel operators to adjust transit and fishing locations to avoid conflicts with construction related to OSW energy development, would help ensure that fishing businesses could continue to operate with minimal disruption.	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.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.
Presence of structures: Onshore construction	Onshore OSW and non-OSW development supports local population growth, employment, and economics.	Onshore development would continue in accordance with local government land use plans and regulations.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Presence of structures: Space use conflicts	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. To the extent that the impacts of future OSW activities result in declines in the economic performance of commercial and for-hire recreational fisheries, workers employed in these fisheries, including fishing vessel crewmembers and seafood processor workers, could be adversely affected. However, WTG spacing and orientation measures, together with the ability of fishing vessel operators to adjust transit and fishing locations to avoid conflicts with construction related to OSW energy development, would help ensure that fishing businesses could continue to operate with minimal disruption.	Reasonably foreseeable activities (non–OSW) would not result in additional offshore structures.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.
Presence of structures: Viewshed	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. These structures are visible from certain views and could impact employment and economic activity in the tourism industry by affecting the decisions of tourists in selecting coastal locations to visit.	Reasonably foreseeable activities (non–OSW) would not result in additional offshore structures.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.
Traffic: Vessels	Constructed and permitted OSW COP projects are using vessels to support construction and O&M activities. Ports and marine traffic related to shipping, fishing, and recreation are important to the region's economy. Vessel traffic related to OSW energy project construction can cause congestion and delays, thereby increasing vessel fuel costs (i.e., for vessels forced to wait for port traffic to pass) and decreasing productivity for commercial shipping businesses.	New vessel traffic near the GAA 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 employment.	See Section 3.12.2.2.2 for analysis.	See Section 3.12.2.3 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.
Climate change	Climate models predict climate change if current trends continue. Climate change has adverse implications for demographics and the economic health of coastal communities, due in part to the costs of resultant damage to property and infrastructure, fisheries, and other natural resources; increased disease frequency; and sedimentation, among other factors. Factors that make environmental justice populations particularly vulnerable to the adverse health, safety, and economic impacts of climate change-–related events such as heat waves, heavy flooding, and droughts include where they live, language	Onshore projects that reduce air emissions could contribute to the effort to limit climate change. Onshore solar and wind energy projects, although producing less energy than potential OSW developments, would also provide incremental reductions.	See Section 3.12.2.2.2 for analysis.	See Sections 3.12.2.3 and 3.12.2.4 and Section 3.12.2.1, Table 3.12-4 for analysis of impacts.	See Section 3.12.2.1, Table 3.12-4 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	barriers, their health, and their limited financial resources to cope with these effects (Cho 2020; EPA 2017). The frequency and intensity of climate-related events such as heat waves and heavy flooding are becoming more frequent and more intense across most land regions, and this trend is expected to continue (IPCC 2021).				

* Includes all constructed and permitted COP projects within the environmental justice GAA: Block Island, SFWF, Vineyard Wind 1, and Coastal Virginia Offshore Wind.

Cultural Resources

No IPFs with solely negligible impacts were identified.

Table E2-9. **Summary of Activities and the Associated Impact-Producing Factors for Cultural Resources**

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Fuel/fluids/hazmat	Constructed and permitted OSW COP projects can accidentally release an estimated 900,000 gallons of fuel, oils, or other hazardous materials in the viewshed GAA. See Table E1-4 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 and/or seafloor sediments can cause impacts on cultural resources because resources are impacted 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 GAA 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 the 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 and/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.	See Sections 3.10.2.2.2 and 3.10.2.2.3 for analysis.	See Sections 3.10.2.5 and 3.10.2.6 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Trash and debris	Constructed and permitted OSW COP projects can potentially generate operational waste, including bilge and ballast water, sanitary and domestic wastes, and trash and debris in the GAA. Accidental releases of trash and debris also 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 cultural resources. In addition, the presence of large amounts of trash on shorelines or the ocean surface can impact the cultural value of TCPs for stakeholders. State and federal laws prohibiting large releases of trash would limit the size of any individual release and ongoing local, state, and federal efforts to clean up trash on beaches and waterways would continue to mitigate the effects of small-scale accidental releases of trash.	Future activities with the potential to result in accidental releases consist of 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.	See Sections 3.10.2.2.2 and 3.10.2.2.3 for analysis.	See Sections 3.10.2.5 and 3.10.2.6 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.
Anchoring	The use of OSW and non-OSW vessel anchoring and gear (i.e., wire ropes, cables, chains on the seafloor) that disturbs the seafloor, such as bottom trawls and anchors, by military, recreational, industrial, and commercial vessels can impact cultural resources by physically damaging marine cultural resources such as shipwrecks and debris fields.	Future activities with the potential to result in anchoring/gear utilization consist of 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.	See Section 3.10.2.2.2 for analysis.	See Section 3.10.2.5 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.
Light: Vessels	Light associated with military, commercial, or OSW and non-OSW 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 operations 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	Future activities with the potential to result in vessel lighting impacts consist of 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.	See Section 3.10.2.2.4 for analysis.	See Section 3.10.2.6 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	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.				
Light: Structures	The construction of new OSW and non-OSW structures that introduce new light sources into the setting of historic architectural properties or TCPs can result in impacts, particularly if the historic and/or cultural significance of the resource is associated with uninterrupted nighttime skies or periods of darkness. Any tall structure (commercial building, radio antenna, large satellite dishes, etc.) 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.	See Section 3.10.2.2.4 for analysis.	See Section 3.10.2.6 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.
Presence of structures	Constructed and permitted OSW COP projects are introducing 81 structures into the GAA, which are visible from some coastal locations in New York, Connecticut, Rhode Island, and Massachusetts.	Non-OSW structures that could be viewed would be limited to met towers. Marine activity would also occur within the marine viewshed of the GAA.	See Sections 3.10.2.2.2, 3.10.2.2.3, and 3.10.2.2.4 for analysis.	See Sections 3.10.2.5, 3.10.2.6, and 3.10.2.7 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.
Presence of structures: Onshore construction	Onshore OSW and non-OSW construction activities can impact terrestrial cultural resources by damaging and/or removing resources.	Future activities that could result in terrestrial land disturbance impacts consist of onshore residential, commercial, industrial, and military development activities in and near Quonset Point, Rhode Island. Onshore construction would continue at current rates.	See Section 3.10.2.2.3 for analysis.	See Section 3.10.2.5 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.
New cable emplacement/ maintenance	Current offshore construction activity is limited to submarine fiber-optic and electrical transmission cables, including six existing power cables in the GAA. Constructed and permitted OSW COP projects are also introducing an estimated 462 miles of new offshore cable in the GAA. Cable installation and maintenance from future OSW activities and other submarine cables could physically impact marine cultural resources.	Future activities with the potential to result in seafloor disturbances similar to offshore impacts consist of 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 marine cultural resources, including shipwrecks and formerly subaerially exposed pre-contact Native American cultural sites.	See Sections 3.10.2.2.2 and 3.10.2.2.3 for analysis.	See Sections 3.10.2.5 and 3.10.2.6 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.
Climate change: Warming and sea level rise, storm severity/frequency	Sea level rise and increased storm severity and frequency would result in impacts on archaeological, architectural, and TCP resources. Increased storm frequency and	Sea level rise and storm severity/frequency would increase due to the effects of climate change.	See Sections 3.10.2.2.2, 3.10.2.2.3, and 3.10.2.2.4 for analysis.	See Sections 3.10.2.5, 3.10.2.6, and 3.10.2.7 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	severity would also result in damage to and/or destruction of architectural properties. Sea level rise would increase erosion-related impacts on archaeological and architectural resources, while sea level rise would inundate archaeological, architectural, and TCP resources.				
Climate change: Warming and sea level rise, altered habitat/ecology	Altered habitat/ecology related to warming seas and sea level rise would impact the ability of Native Americans and other communities to use maritime TCPs for traditional fishing, shell fishing, and fowling activities.	The rate of change to habitats/ecology would increase as a result of climate change.	See Sections 3.10.2.2.2, 3.10.2.2.3, and 3.10.2.2.4 for analysis.	See Sections 3.10.2.5, 3.10.2.6, and 3.10.2.7 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.
Climate change: Warming and sea level rise, altered migration patterns	Altered migration patterns related to warming seas and sea level rise would impact the ability of Native Americans and other communities to use maritime TCPs for traditional fishing, shellfishing, and fowling activities.	The rate of change to migratory animal patterns would increase as a result of climate change.	See Sections 3.10.2.2.2, 3.10.2.2.3, and 3.10.2.2.4 for analysis.	See Sections 3.10.2.5, 3.10.2.6, and 3.10.2.7 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.
Climate change: Warming and sea level rise, property/ infrastructure damage	Sea level rise and increased storm severity and frequency would result in impacts on archaeological, architectural, and TCP resources. Increased storm frequency and severity would result in damage to and/or destruction of architectural properties. Sea level rise would increase erosion-related impacts on archaeological and architectural resources, while sea level rise would inundate archaeological, architectural, and TCP resources.	The rate of property and infrastructure damage would increase as a result of climate change.	See Sections 3.10.2.2.2, 3.10.2.2.3, and 3.10.2.2.4 for analysis.	See Sections 3.10.2.5, 3.10.2.6, and 3.10.2.7 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.
Climate change: Warming and sea level rise, protective measures (barriers, sea walls)	The installation of protective measures such as barriers and sea walls would impact cultural resources during associated ground-disturbing activities. Construction of these modern protective structures would alter the viewsheds from historic properties and/or TCPs, resulting in impacts on the historic and/or cultural significance of resources.	The installation of coastal protective measures would increase as a result of climate change.	See Sections 3.10.2.2.2, 3.10.2.2.3, and 3.10.2.2.4 for analysis.	See Sections 3.10.2.5, 3.10.2.6, and 3.10.2.7 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.
Climate change: Warming and sea level rise, storm severity/frequency, sediment erosion, deposition	Sea level rise and increased storm severity and frequency would result in impacts on archaeological, architectural, and TCP resources. Increased storm frequency and severity would result in damage to and/or destruction of architectural properties. Sea level rise would increase erosion-related impacts on archaeological and architectural resources, while sea level rise would inundate	Sea level rise and storm severity/frequency would increase due to the effects of climate change.	See Sections 3.10.2.2.2, 3.10.2.2.3, and 3.10.2.2.4 for analysis.	See Sections 3.10.2.5, 3.10.2.6, and 3.10.2.7 and Section 3.10.2.1, Table 3.10-7 for analysis of impacts.	See Section 3.10.2.1, Table 3.10-7 for analysis of impacts.

Associated IPF: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	archaeological, architectural, and TCP resources.				

* Includes three constructed and permitted COP projects within the cultural resources viewshed GAA: Block Island, SFWF, and Vineyard Wind 1. The marine resources GAA only intersects SFWF, and the terrestrial GAA does not intersect any constructed and permitted COP projects.

Recreation and Tourism

Table E2-10. Summary of Activities and the Associated Impact-Producing Factors for Recreation and Tourism

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Anchoring	Constructed and permitted OSW COP projects are introducing an estimated 943 acres of anchoring in the GAA. Anchoring also occurs due to ongoing military, survey, commercial, and recreational activities. The presence of anchored vessels can increase navigation complexity for recreational vessels. Increased turbidity from anchoring can also briefly alter the behavior of species important to recreational fishing and sightseeing. However, impacts are anticipated to be temporary and localized.	Impacts from anchoring would continue and could increase due to offshore military operations, survey activities, commercial vessel traffic, and/or 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.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.
Light: Vessels	Nighttime vessel activity associated with permitted and built OSW COP projects is occurring during installation and O&M of various project components (cables, substation etc.). This source, along with light associated with other military, commercial, or construction vessel traffic, can temporarily affect coastal viewsheds when the addition of intrusive, modern lighting changes the physical environment (setting).	Anticipated modest growth in vessel traffic would result in some growth in the nighttime traffic of vessels with lighting.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.
Light: Structures	Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis. Constructed and permitted OSW COP projects are also introducing 81 lighted structures into the GAA. Lighted structures can result in impacts to impact recreation and tourism if recreation decisions are influenced by lighting, particularly if the light source affects uninterrupted nighttime skies or periods of darkness.	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.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.
New cable emplacement/ maintenance	Constructed and permitted OSW COP projects are introducing an estimated 462 miles of new offshore cable in the GAA. This and other	Cable maintenance or replacement of existing cables in the GAA would occur infrequently and would generate short-term disturbances.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	sources of cable activities can reduce recreational opportunities if individuals prefer to avoid the noise and disruption caused by installation; these disturbances would be localized and limited to emplacement corridors.				
Noise: O&M	Noise impacts are expected from OSW and non-OSW O&M activity. However, sound pressure levels would be at or below ambient levels at relatively short distances from WTG foundations.	Not applicable.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.
Noise: Pile driving	Noise from pile driving associated with permitted OSW COP projects is occurring during installation of foundations for offshore structures. Noise from pile driving also occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area.	No future activities were identified within the recreation and tourism GAA other than ongoing activities.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts during offshore activities.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.
Noise: Cable laying/trenching	Noise from trenching/cable laying associated with permitted OSW COP projects may occur in the GAA. Offshore trenching occurs periodically in connection with non-OSW cable installation or sand and gravel mining. These disturbances are temporary, local, and extend only a short distance beyond the work area.	No future activities were identified within the recreation and tourism GAA other than ongoing activities.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing OSW and non-OSW activities that contribute to this sub-IPF consist of permitted and construction OSW COP projects, 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.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts during offshore activities.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.
Port utilization: Expansion	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. The New Bedford Marine Commerce Terminal was upgraded by the port specifically to support the construction of OSW 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 be able to host larger deep draft vessels as they continue to increase in size.	**Offshore:** Existing ports used for staging and construction of planned future projects could influence recreational opportunities or access. However, these ports are primarily industrial in character and are not intended to support recreational activity as a primary use. If used secondarily for recreation, any port improvements could result in short-term delays and crowding during construction but would result in increased berths and amenities for recreational vessels, improved	**Offshore:** Existing ports in the GAA that would be used for Project staging and construction consist of the Port of Montauk, Port Jefferson, Port of Providence, Port of Davisville at Quonset Point, Point of Galilee, Port of New London, and New Bedford Marine Commerce Terminal. However, these ports are primarily industrial in character and are not intended to service recreational activity. Therefore, the Proposed Action would have a long-term **negligible** adverse impact on recreation and	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, Alternative G would have a **negligible** adverse impact on recreation and tourism due to port utilization within the GAA.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
			navigational channels, or opportunities to separate recreational boating from commercial shipping in the long term. Because impacts to offshore recreation and tourism related to current marine industrial activities at existing ports would not experience significant changes, regardless of OSW industry development (BOEM 2016), only **negligible** adverse impacts on recreation and tourism could occur.	tourism due to port utilization within the GAA. Impacts of Alternatives C through F would be similar to the Proposed Action. As previously noted, existing ports used for O&M of the Project could influence recreational opportunities or access. However, these ports are primarily industrial in character and are not intended to support recreational activity as a primary use. Because impacts to offshore recreation and tourism related to current marine industrial activities at existing ports would not experience significant changes, regardless of OSW industry development (BOEM 2016), negligible adverse impacts on recreation and tourism could occur. Impacts during decommissioning would be similar to the impacts during construction and installation. Although Alternatives C through F would reduce the number of WTGs and associated IACs, the impact would be **negligible** adverse. Port activity would result in increased short-term construction traffic and long-term operational traffic to the No Action Alternative, which could coincide with recreational activity in the vicinity, depending on transportation type (e.g., vessels, rail, or road vehicle). However, activities related to the Proposed Action at port facilities would occur within the boundaries of existing ports or other repurposed industrial facilities where recreational users would not be expected to occur. Project activities at ports would be similar to those already taking place at these facilities and would be consistent with state and local agency guidelines regarding land use, access, noise and air quality, and other impacts on nearby neighborhoods. Alternatives C through F would reduce the number of WTGs and associated IACs, but Project impacts on this IPF would be similar to the Proposed Action, Therefore, the Proposed Action and Alternatives C through F when combined with past, present, and reasonably foreseeable activities would have **negligible** adverse cumulative impacts on recreation and tourism.	

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
			Onshore: Impacts to onshore recreation and tourism related to current marine industrial activities at existing ports would not result in significant changes, regardless of OSW industry development (BOEM 2016). Therefore, impacts would be **negligible** adverse.	**Onshore:** The proposed O&M facility (located in the Port of Brooklyn, Port of Davisville at Quonset Point, Port of Galilee, Port Jefferson, or Port of Montauk) would be located within an existing industrial port. No new building construction would occur at the Port of Galilee or Port of Brooklyn; use of these ports is assumed to be limited to existing facilities maintained by the ports. However, a new building with up to 1,000 square feet of office space and up to 11,000 square feet of equipment storage space could be constructed at the Port of Davisville at Quonset Point or the Port of Montauk. A BOEM study suggests that impacts on recreation and tourism related to current marine industrial activities at existing ports would not experience significant long-term changes, regardless of OSW industry development (BOEM 2016). However, the study notes that although the Atlantic Coast already possesses the necessary infrastructure to support OSW, the industry is still evolving (BOEM 2016), and communication, flexibility, and scalability are needed to ensure port selection would not impact tourism or recreation. Based on BOEM's findings, **negligible** temporary adverse impacts to recreation or tourism activities from port use are anticipated during construction. O&M facilities and activity would be indistinguishable from other industrial or commercial businesses and maritime activities that typically occur at proposed port locations. As these ports do not provide recreation as a primary service, O&M would have **negligibl**e adverse impacts on onshore recreation and tourism. Project facilities and port activity would be indistinguishable from other industrial or commercial businesses and maritime activities that typically occur at proposed port locations. As these ports do not provide recreation as a primary service, the Proposed Action and Alternatives C through F when combined with past, present, and reasonably foreseeable projects would result in	**Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, Alternative G would have a **negligible** adverse impact on recreation and tourism due to port utilization within the GAA.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				temporary **negligible** adverse cumulative impacts to onshore recreation and tourism.	
Port utilization: Maintenance/ Dredging	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. Periodic maintenance is necessary for harbors within the GAA.	Ongoing maintenance and dredging of harbors within the GAA would continue as needed. No specific projects are known.	See Port Utilization: Expansion for analysis of offshore and onshore impacts.	See Port Utilization: Expansion for analysis of offshore and onshore impacts.	See Port Utilization: Expansion for analysis of offshore and onshore impacts.
Presence of structures: Allisions	Constructed and permitted OSW COP projects are introducing 81 structures into the GAA. 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 presence of OSW structures increases the GAA's navigational complexity, thereby increasing the risk of allision or collision. However, WTG spacing is anticipated to reduce, but not eliminate, navigational complexity during the operations phases of the projects.	Vessel allisions with non-OSW stationary objects should not increase meaningfully without a substantial increase in vessel congestion.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts during offshore activities.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.
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. Additionally, constructed and permitted OSW COP projects are introducing 81 structures into the GAA that can increase risk of entanglement by recreational fishermen.	No future activities were identified within the recreation and tourism GAA other than ongoing activities.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts during offshore activities.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.
Presence of structures: Fish aggregation and habitat conversion	Constructed and permitted OSW COP projects are introducing 81 structures into the GAA. 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–OSW) would not result in additional offshore structures.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts during offshore activities.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.
Presence of structures: Navigation hazard	Constructed and permitted OSW COP projects are introducing 81 structures into the GAA. 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. The presence of OSW structures increases the GAA's	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.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts during offshore activities.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	navigational complexity, thereby increasing the risk of allision or collision. However, WTG spacing is anticipated to reduce, but not eliminate, navigational complexity during the operations phases of the projects.				
Presence of structures: Space use conflicts	Currently, the offshore area is occupied by marine trade, stationary and mobile fishing, and survey activities. Constructed and permitted OSW COP projects are also introducing 81 structures into the GAA. The presence of OSW structures increases the GAA's navigational complexity. The attraction of artificial reef effects also increases vessel congestion and the risk of allision, collision, and spills near structures. However, WTG spacing is anticipated to reduce, but not eliminate, space-use conflicts during the operations phases of the projects.	Reasonably foreseeable activities (non–OSW) would not result in additional offshore structures.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts during offshore activities.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.
Presence of structures: Viewshed	Constructed and permitted OSW COP projects are introducing 81 structures into the GAA, which are visible from some coastal locations in New York, Connecticut, Rhode Island, and Massachusetts.	Non-OSW structures that could be viewed in conjunction with the offshore components of the Project would be limited to met towers. Marine activity would also occur within the marine viewshed.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.
Traffic: Vessels	The GAA would continue to have numerous ports, and the extensive OSW and non-OSW marine traffic related to shipping, fishing, and recreation would continue to be important to the region's economy.	New vessel traffic in the GAA 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 economy.	See Section 3.18.2.2.2 for analysis.	See Section 3.18.2.3 and Section 3.18.2.1, Table 3.18-2 for analysis of impacts.	See Section 3.18.2.1, Table 3.18-2 for analysis of impacts.

* Includes three constructed and permitted COP projects within the recreation and tourism GAA: Block Island, SFWF, and Vineyard Wind 1.

Visual Resources

No IPFs with solely negligible impacts were identified.

Table E2-11. Summary of Activities and the Associated Impact-Producing Factors for Visual Resources

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Light: Vessels	Nighttime vessel activity associated with permitted and built OSW COP projects is occurring during installation and O&M of various project components (cables, substation, etc.). This light source, along with light associated with other military, commercial, or construction vessel traffic, can	Future activities with the potential to result in vessel lighting impacts consist of 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	See Section 3.20.2.2.2 for analysis.	See Section 3.20.2.3 and Section 3.20.2.1, Table 3.20-1 for analysis.	See Section 3.20.2.1, Table 3.20-1 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	temporarily affect coastal viewsheds when the addition of intrusive, modern lighting changes the physical environment (setting). 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.	use and management; and oil and gas activities. Light pollution from vessel traffic would continue at the current intensity along the Northeast coast, with a slight increase due to population increase and development over time.			
Light: Structures	Constructed and permitted OSW COP projects are introducing 81 lighted structures into the GAA. The construction of new structures that introduce new light sources can result in impacts, particularly if the light source affects uninterrupted nighttime skies or periods of darkness. Any tall structure (e.g., commercial building, radio antenna, large satellite dish) 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.	See Section 3.20.2.2.2 for analysis.	See Section 3.20.2.3 and Section 3.20.2.1, Table 3.20-1 for analysis.	See Section 3.20.2.1, Table 3.20-1 for analysis.
Presence of structures	Constructed and permitted OSW COP projects are introducing 81 structures into the GAA, which are visible from some coastal locations in New York, Connecticut, Rhode Island, and Massachusetts.	Non-OSW structures that could be viewed would be limited to met towers. Marine activity would also occur within the viewshed of the GAA.	See Section 3.20.2.2.2 for analysis.	See Section 3.20.2.3 and Section 3.20.2.1, Table 3.20-1 for analysis.	See Section 3.20.2.1, Table 3.20-1 for analysis.

* Includes three constructed and permitted COP projects within the visual resources GAA: Block Island, SFWF, and Vineyard Wind 1.

Commercial Fisheries and For-Hire Recreational Fishing

No IPFs with solely negligible impacts were identified.

Table E2-12. Summary of Activities and the Associated Impact-Producing Factors for Commercial Fisheries and For-Hire Recreational Fishing

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Fuel/fluids/hazmat	Constructed and permitted OSW COP projects can accidentally release an estimated 900,000 gallons of fuel, oils, or other hazardous materials in the GAA. See Table E1-4 for a quantitative analysis of these risks. Ongoing releases are frequent and chronic. Accidental releases and discharges of fuels and fluids that reduce water quality could have a physiological or behavioral impact on some species targeted by commercial and for-hire recreational fisheries in the GAA.	Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases. Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Section 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	However, all vessels would comply with USCG requirements and BSEE regulations for the prevention and control of oil and fuel spills.				
Accidental releases: Trash and debris	Constructed and permitted OSW COP projects can potentially generate operational waste, including bilge and ballast water, sanitary and domestic wastes, and trash and debris in the GAA. Trash and debris could also be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, and lines and pipeline laying. Accidental releases of trash and debris are expected to be low probability events.	No future activities were identified within the GAA other than ongoing activities.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Section 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.
Anchoring	Constructed and permitted OSW COP projects are introducing an estimated 944 acres of anchoring in the GAA. Impacts from anchoring also occur due to other ongoing military, survey, commercial, and recreational activities. The short-term, localized impact to this resource is the presence of a navigational hazard (anchored vessel) to fishing vessels.	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Anchoring could pose a temporary (hours to days), localized (within a few hundred meters of the anchored vessel) navigational hazard to fishing vessels.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.
Light	Impacts include light associated with military, commercial, or OSW and non-OSW construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light 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.	Future activities with the potential to result in 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.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.
New cable emplacement/ maintenance	Constructed and permitted OSW COP projects are introducing an estimated 498 miles of new offshore cable in the GAA. This and other non-OSW cable activities can disturb the seafloor, increase suspended sediment, and cause temporary displacement of fishing vessels. These disturbances would be local 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 local, short-term impacts. If the cable routes enter the GAA for this resource, short-term disruption of fishing activities would be expected.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Noise: Construction, trenching, O&M	Noise from onshore construction associated with permitted OSW COP projects is occurring during installation of various project components (cables, substation etc.). Other 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 is difficult to generalize, but impacts are local and temporary. Infrequent offshore trenching could occur in connection with cable installation. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Low levels of elevated noise from operational WTGs 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 local impacts on fish, but likely no impacts at a fishery level.	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the GAA for this resource. Noise from dredging and sand and gravel mining could occur. New or expanded marine minerals extraction could increase noise during their O&M over the next 35 years. Impacts from construction, operations, and maintenance would likely be small and local 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, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on commercial fish species are typically less prominent than the impacts of the physical disturbance and sediment suspension. Therefore, fishery-level impacts are unlikely.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.
Noise: G&G	Noise from G&G and scientific surveys associated with permitted OSW COP projects may occur in the GAA. 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 seafloor, 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 local and temporary.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.
Noise: Pile driving	Noise from pile driving associated with permitted OSW COP projects is occurring during installation of foundations for offshore structures. Noise from pile driving also occurs periodically in nearshore areas when ports or marinas, piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or the seafloor can cause	No future activities were identified within the GAA other than ongoing activities.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	injury and/or mortality to 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, local impacts on commercial fisheries and for-hire recreational fishing. The extent depends on pile size, hammer energy, and local acoustic conditions.				
Noise: Vessels	Vessel noise is anticipated to continue at levels similar to current levels. While OSW and non-OSW vessel noise could have some impact on behavior, it is likely limited to brief startle and temporary stress responses. Ongoing activities that contribute to this sub-IPF consist of permitted and construction OSW COP projects, 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.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.
Port utilization: Expansion	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing 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 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 could require port modifications, such as channel deepening, leading to local impacts on fish populations. Port expansions could also increase vessel traffic and competition for dockside services, which could affect fishing vessels.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.
Presence of structures: Navigation hazard and allisions	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. Other structures that pose potential navigation hazards consist of 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	No known reasonably foreseeable structures are proposed to be located in the GAA that could affect commercial fisheries. Vessel allisions with non-OSW stationary objects should not increase meaningfully without a substantial increase in vessel congestion.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	control their vessel movements or is distracted. The presence of OSW structures increases the GAA's navigational complexity, thereby increasing the risk of allision or collision. However, WTG spacing is anticipated to reduce, but not eliminate, navigational complexity during the operations phases of the projects.				
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. Additionally, constructed and permitted OSW COP projects are introducing 83 structures into the GAA that can increase risk of entanglement. 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 GAA other than ongoing activities.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.
Presence of structures: Habitat conversion and fish aggregation	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. 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 and/or complex habitat. Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitats to the new hard-structure habitat. Structure-oriented fishes are attracted to these locations. These impacts are local and can be short term to permanent. Fish aggregation could be considered adverse, beneficial, or neither. Commercial and for-hire recreational fishing can occur near these structures. For-hire recreational fishing is more popular because commercial mobile fishing gear is more likely to snag on structures.	New cables, installed incrementally in the GAA over the next 20 to 35 years, would likely require hard protection atop portions of the route (see the New cable emplacement/maintenance IPF above). Any new towers, buoys, or piers would also create uncommon relief in a mostly flat seascape. Structure-oriented species could be attracted to these locations. Structure-oriented species would benefit (Claisse et al. 2014; Smith et al. 2016). This could 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 (Greene et al. 2010; Guida et al. 2017). These impacts are expected to be local and could be long term.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.
Presence of structures: Migration disturbances	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. 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	The infrequent installation of future new structures in the marine environment over the next 35 years could 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	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	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.	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	Currently, the offshore area is occupied by marine trade, stationary and mobile fishing, and survey activities. Constructed and permitted OSW COP projects are also introducing 83 structures into the GAA. The presence of OSW structures increases the GAA's navigational complexity. The attraction of artificial reef effects also increases vessel congestion and the risk of allision, collision, and spills near structures. However, WTG spacing is anticipated to reduce, but not eliminate, space-use conflicts during the operations phases of the projects.	No known reasonably foreseeable structures are proposed for location in the GAA that could affect commercial fisheries and for-hire recreational fishing.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.
Presence of structures: Cable infrastructure	The existing offshore cable infrastructure supports the economy by transmitting electric power and communications between the mainland and islands. Seven submarine cable corridors cross cumulative lease areas. Shoreline developments are ongoing and consist of docks; ports; and other commercial, industrial, and residential structures. Additionally, constructed and permitted OSW COP projects are introducing an estimated 462 miles of new offshore cable in the GAA. Increased presence of cables and cable protection may increase the risk of gear loss or entanglement.	No future activities were identified within the GAA for this resource other than ongoing activities.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.
Traffic: Vessels and vessel collisions	The GAA would continue to have numerous ports, and the extensive OSW and non-OSW marine traffic related to shipping, fishing, and recreation would continue to be important to the region's economy. The region's substantial marine traffic could 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 GAA 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.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Climate change	Impacts to commercial fisheries and for-hire recreational fishing are expected to result from climate change events such as increased magnitude or frequency of storms, shoreline changes, ocean acidification, and water temperature changes. Risks to fisheries associated with these events include habitat/distribution shifts, disease incidence, and risk of invasive species. If these risk factors result in a decrease in catch and/or an increase in fishing costs (e.g., transiting time), the profitability of businesses engaged in commercial fisheries and for-hire recreational fishing would be adversely affected. While climate change is predicted to have adverse impacts on the distribution and/or productivity of some stocks targeted by commercial fisheries and for-hire recreational fishing, other stocks could be beneficially affected. The economies of communities reliant on marine species that are vulnerable to the effects of climate change could be adversely affected. If the distribution of important stocks changes, it could affect where commercial and for-hire recreational fisheries are located. Furthermore, coastal communities with fishing businesses that have infrastructure near the shore could be adversely affected by sea level rise.	No future activities were identified within the GAA for this resource other than ongoing activities.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.
Fisheries management activities	Commercial and recreational regulations for finfish and shellfish implemented and enforced by NMFS and coastal states affect how the commercial and for-hire recreational fisheries operate. Commercial and recreational for-hire fisheries are managed by FMPs, which are established to manage fisheries to avoid overfishing through catch quotas, special management areas, and closed area regulations. These can reduce or increase the size of available landings to commercial and for-hire recreational fisheries. For example, ongoing fishing restrictions designed to rebuild depleted stocks in the Northeast Multispecies (large-mesh) fishery would continue to reduce landings in that fishery.	Reasonably foreseeable fishery management actions include measures to reduce the risk of interactions between fishing gear and the NARW by 60% (McCreary and Brooks 2019). This would likely have a **major** adverse impact on fishing effort in the lobster and Jonah crab fisheries in the GAA for this resource. As discussed in Karp et al. (2019), changing climate and ocean conditions and the resultant effects on species distributions and productivity can have significant effects on management decisions, such as allocation, spatiotemporal closures, stock status determinations, and catch limits.	See Section 3.9.2.2.2 for analysis of offshore impacts.	See Sections 3.9.2.3 and 3.9.2.4 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.	See Sections 3.9.2.5 and Section 3.9.2.1, Table 3.9-23 for analysis of offshore impacts.

* Includes all constructed and permitted COP projects within the commercial fisheries and for-hire recreational fishing GAA: Block Island, SFWF, Vineyard Wind 1, and Coastal Virginia Offshore Wind.

Land Use and Coastal Infrastructure

Table E2-13. Summary of Activities and the Associated Impact-Producing Factors for Land Use and Coastal Infrastructure

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases: Fuel/fluids/hazmat	Various ongoing OSW and non-OSW onshore and coastal construction projects include the use of vehicles and equipment that contain fuel, fluids, and hazardous materials that could be released. These impacts, however, would generally be localized and short term.	Ongoing onshore construction projects involving vehicles and equipment that use fuel, fluids, or hazardous materials could result in an accidental release. Intensity and extent would vary, depending on the size, location, and materials involved in the release.	See Section 3.14.2.2.2 for analysis.	See Sections 3.14.2.3 and 3.14.2.1, Table 3.14-1 for analysis of impacts.	See Section 3.14.2.1, Table 3.14-1 for analysis of impacts.
EMFs	Constructed and permitted OSW COP projects can generate EMF and substrate heating effects. EMFs also continuously emanate from existing telecommunication and electrical power transmission cables. New cables generating EMFs are infrequently installed in the GAA. The extent of impacts is likely less than 50 feet (15.2 m) from the cable, and the intensity of impacts on coastal habitats is likely undetectable.	No future activities were identified within the GAA for land use and coastal infrastructures other than ongoing activities.	The onshore transmission lines used to connect power generated by future OSW projects to the electrical grid would generate detectable EMF effects within a short distance of cable corridors. Most, if not all, future onshore transmission cables would run belowground in buried cable ducts, reducing EMF exposure relative to aboveground electrical infrastructure. Based on modeled EMF levels for currently planned projects (Exponent 2018, 2020), typical EMF levels at approximately 3 feet (1 meter) immediately above the buried cable would range from 73 to 300 mG. Field strength would diminish rapidly with distance, decreasing to near 0 mG within 25 to 50 feet of the cable centerline. These potential effects must be placed in context with typical levels of EMF exposure experienced in everyday life. The National Institutes of Health (NIH 2002) determined that approximately 95% of the U.S. population has an average daily EMF exposure of approximately 4 mG from electrical systems and devices at home and work. Localized EMF levels in proximity to electrical power infrastructure are considerably higher. Typical magnetic fields within 50 feet of power distribution lines range from 10 to 20 mG for main feeders and 3 to 10 mG for laterals under typical loads, reaching as high as 40 to 70 mG under peak loads depending on the amount of current being carried (NIH 2002). Anticipated onshore EMF from OSW energy transmission cables would be comparable to, if not lower than, baseline EMF levels	**Offshore:** There would be no EMF produced during construction of the offshore Project structures. Offshore elements of the Proposed Action such as the WTGs, IAC, and OSS-link cable would generate EMF during operation. The cables produce a magnetic field, both perpendicularly and in a lateral direction around the cables. The calculated magnetic field at a height of 3.3 feet (1 m) above the seafloor is highest directly above the buried cables (IACs, 17 mG; RWECs, 41 mG; and RWEC landfall cables, 39 mG) and decreases rapidly with distance. EMF is reduced to less than 6 mG within 30 feet of the IACs, RWECs, and RWEC landfall cables. All calculated field levels are well below the ICNIRP reference level of 2,000 mG and the ICES exposure reference level of 9,040 mG for exposure of the general public. Therefore, effects would be **negligible** adverse. Impacts would be lower, but still similar, for Alternatives C through F due to the reduction of the number of WTGs and possible reduction of miles of IAC. Reasonably foreseeable future actions would also generate offshore EMF due to the use of similar Project components. However, it is anticipated that reasonably foreseeable future actions would also use similar construction and operations techniques, which includes shielding and protecting cables that are laid directly on the seafloor. Shielded electrical transmission cables do not directly emit electrical fields into surrounding areas but are surrounded by magnetic fields that can cause induced electrical fields in	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. There would be no EMF produced during construction of the offshore Project structures. Operational effects would be **negligible** adverse. Impacts would be lower, but still similar, for Alternative G due to the reduction of the number of WTGs and possible reduction of miles of IAC. Due to the rapid dissipation of EMFs surrounding the cables and incorporation of protection measures, there would be a **negligible** adverse cumulative impact on land use and coastal infrastructure for Alternative G. Impacts would be lower, but still similar, for Alternative G due to the reduction of the number of WTGs and possible reduction of miles of IAC.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
			generated by existing aboveground electrical infrastructure. Future OSW projects would likely generate EMF levels similar to those for the Project. International Commission on Non-Ionizing Radiation Protection (ICNIRP) and International Committee on Electromagnetic Safety (ICES) guidance set exposure levels between 2,000 and 9,040 mG for the general population, although exact levels vary from state to state. The addition of wind energy transmission cables would result in slightly elevated onshore EMF levels. However, EMF levels decrease very rapidly with distance from the cables. For an 880-MW transmission cable, peak EMF would be 73 mG at the cable but would decrease to 2 mG at 25 feet from the cable. This is well below international EMF standards. The presence of slightly elevated levels of EMF from future OSW activities would have no effect on land use and coastal infrastructure because elevated EMF would not alter land use patterns, change land uses, or have any other effect on land use and coastal infrastructure. On this basis, the effects of EMF on land use under the No Action Alternative would be long term **negligible** adverse, as there would be no effect on land use and coastal infrastructure.	moving water. Due to the rapid dissipation of EMFs surrounding the cables and incorporation of protection measures, there would be a **negligible** adverse cumulative impact on land use and coastal infrastructure for the Proposed Action and Alternatives C through F. Impacts would be lower, but still similar, for Alternatives C through F due to the reduction of the number of WTGs and possible reduction of miles of IAC.	
				Onshore: There would be no EMF produced during construction of the onshore Project structures. Between the TJBs and OnSS, the onshore transmission cables would be installed in a double-circuit underground duct bank. Modeling of the magnetic field levels associated with the operation of these cables calculates the magnetic field at peak loading directly over the duct banks at 73 mG or lower for the maximum 880-MW capacity of the RWF. This is well below the ICNRIP reference level of 2,000 mG and the ICES exposure reference level of 9,040 mG for the general public (Exponent 2020). Lower magnetic fields would be produced if the power generated by the RWF is less than 880 MW. Based on modeled EMF levels for the Proposed Action (Exponent 2020), typical EMF levels at approximately 3 feet (1 m) immediately above the buried cable would be a maximum of 73 mG. Field strength would diminish rapidly with distance, decreasing to near 0 mG within 25 to 50 feet of the cable centerline. These potential effects must be placed in context with typical levels of EMF exposure experienced in everyday life. The NIH (2002) determined that approximately 95% of the U.S. population has an average daily EMF exposure of approximately 4 mG from electrical systems and devices at home and work. Localized EMF levels in proximity to electrical power infrastructure are considerably higher. Typical magnetic fields within 50 feet of power distribution lines range from 10 to 20 mG for main feeders and	**Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. There would be no EMF produced during construction of the Alternative G onshore Project structures. There would be no impact on land use and coastal infrastructure due to EMFs from O&M of onshore Project facilities. Decommissioning would result in no EMF impacts, similar to construction. Therefore, there would be a **negligible** adverse EMF impact on land use and coastal infrastructure from O&M and decommissioning of onshore elements of Alternative G. Reasonably foreseeable future actions would likely generate EMF levels similar to those for the Proposed Action. On this basis, the cumulative effects of EMF on land use under Alternative G would be **negligible** adverse as there would be no effect on land use and coastal infrastructure and Alternative G has identical onshore facilities and activities.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				3 to 10 mG for laterals under typical loads, reaching as high as 40 to 70 mG under peak loads, depending on the amount of current being carried (NIH 2002). Therefore, the relative level of EMF from the onshore duct bank would be low compared to other electrical infrastructure. The underground transmission cables onshore would not be a direct source of any electric field aboveground due to cable construction, duct bank, and burial underground (VHB 2023b). As EMFs would remain well below established thresholds and there would be no direct source of aboveground EMFs, it is anticipated that there would be no impact on land use and coastal infrastructure due to EMFs from O&M of onshore Project facilities. Decommissioning would result in no EMF impacts, similar to construction. Therefore, there would be a **negligible** adverse EMF impact on land use and coastal infrastructure from O&M and decommissioning of onshore elements of the Proposed Action and Alternatives C through F. Reasonably foreseeable future actions would likely generate EMF levels similar to those for the Proposed Action. On this basis, the cumulative effects of EMF on land use under all Project alternatives would be **negligible** adverse as there would be no effect on land use and coastal infrastructure and the Proposed Action and Alternatives C through F have identical onshore facilities and activities.	
Light: Structures	Various OSW and non-OSW ongoing onshore and coastal construction projects have nighttime activities, as well as existing structures, facilities, and vehicles, that would use nighttime lighting. All construction and operational impacts from land disturbance would be regulated through local land use and zoning regulations and would therefore comply with applicable laws.	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.	See Section 3.14.2.2.2 for analysis.	See Section 3.14.2.3 and Section 3.14.2.1, Table 3.14-1 for analysis of impacts.	See Section 3.14.2.1, Table 3.14-1 for analysis of impacts.
New cable emplacement/maintenance	Onshore OSW and non-OSW-related buried transmission cables are present in the area near the Project onshore and offshore improvements. Onshore activities would only	No known proposed onshore structures are reasonably foreseeable and proposed to be located in the GAA for land use and coastal infrastructure.	See Section 3.14.2.2.2 for analysis of onshore impacts. Offshore cable activities would not impact onshore land use or infrastructure.	See Section 3.14.2.3 and Section 3.14.2.1, Table 3.14-1 for analysis of onshore impacts. Offshore cable activities would not impact onshore land use or infrastructure.	See Section 3.14.2.1, Table 3.14-1 for analysis of onshore impacts. Offshore cable activities would not impact onshore land use or infrastructure.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	occur where permitted by local land use authorities, which would avoid long-term land use conflicts.				
Noise	Noise from activities associated with permitted OSW COP projects and other non-OSW projects may occur in the GAA. Ongoing noise from construction occurs frequently near the shores of populated areas in New England and the Mid-Atlantic region but infrequently offshore. Noise from construction near shorelines is expected to gradually increase over the next 30 years in line with human population growth along the coast of the GAA. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary.	No future activities were identified within the GAA other than ongoing activities.	See Section 3.14.2.2.2 for analysis.	See Section 3.14.2.3 and Section 3.14.2.1, Table 3.14-1 for analysis of impacts.	See Section 3.14.2.1, Table 3.14-1 for analysis of impacts.
Port utilization: Expansion	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. The MCT at the Port of New Bedford is a completed facility developed by the port specifically to support the construction of OSW 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 be able to host larger deep draft vessels as they continue to increase in size.	Various ports would be improved to support future OSW projects (see EIS Appendix E). These improvements would occur within the boundaries of existing port facilities, would be similar to existing activities at the existing ports, and would support state strategic plans and local land use goals for the development of waterfront infrastructure. Therefore, ports would experience long-term beneficial impacts such as greater economic activity and increased employment due to demand for vessel maintenance services and related supplies; vessel berthing, loading and unloading; warehousing and fabrication facilities for OSW components; and other business activity related to OSW. State and local agencies would be responsible for minimizing the potential adverse impacts of these future port expansions by managing port resources and traffic control to ensure continued access to ports and adjacent land uses. There could be increased traffic and noise associated with increased port use that could impact land uses by increasing congestion and noise. However, all traffic, noise, and other adverse impacts would be under regulatory thresholds as ports would be required to comply with local land use and zoning regulations. On this basis, the effects of port utilization on land use under	**Offshore:** Land uses impacted by the construction of offshore components would include chosen port facilities used for shipping, storing, and fabricating Project components and for crew transfer, cargo logistics, and storage. Revolution Wind would use one or more ports to offload shipments of components, prepare them for installation, and load components onto vessels for delivery and installation. Selected ports could require improvements or upgrades to meet Project needs (see Table 3.3.10-1 of the COP), but no specific port improvements have been proposed as part of the Proposed Action. The COP states that to the extent that upgrades or modifications at an existing port facility could occur, Revolution Wind expects that those upgrades or modifications would serve to support the U.S. OSW industry in general. This is especially true as a number of states continue to procure, support, and fund such development. Thus, whether or not upgrades are required, port facilities are expected to serve multiple OSW projects and potentially also OSW-related and other maritime industries. BOEM (2016) analyzed potential impacts to ports that could require upgrades to accommodate OSW projects or that are in the process of completing upgrades in	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Alternative G would slightly reduce impacts to port utilization due to reduction of the number of WTGs and possible reduction of miles of IAC. However, impacts would be similar to the Proposed Action: long term **minor** beneficial and a **negligible** adverse.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
			the No Action Alternative would be long term **negligible** adverse.	anticipation of increased port use associated with OSW projects. BOEM noted that land use and transportation impacts primarily include land-based space conflicts with current or planned uses of adjacent areas and landside traffic delays or conflicts associated with construction. BOEM (2016) also identified potential water-based space conflicts with other uses of port waterways such as dredging, pile driving, and fill placement. The ports under consideration for construction staging are industrial in character, designated by local zoning and land use plans for heavy industrial activity, and typically adjacent to other industrial or commercial land uses and major transportation corridors. Therefore, it is expected that port improvements or upgrades would be subject to local zoning and land use regulations and that any upgrades to ports would undergo independent permitting and regulatory compliance processes. The development of an OSW industry on the Mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects; however, no specific port improvements are identified as part of the Project. All future port improvements would be subject to independent environmental permitting and regulatory review and would be consistent with local land use and zoning regulations. As such, any future port improvements supporting OSW development would be consistent with, and therefore would not hinder, other nearby land use or use of coastal infrastructure. Overall, construction and installation of offshore components would have minor beneficial impacts to land use and coastal infrastructure by supporting designated uses at ports and supporting port improvements and/or redevelopment. Improvements such as road widening and signalization would provide transportation flow benefits over the long term. Because port expansion and upgrades are not part of the Proposed Action and would undergo separate permitting and regulatory review,	

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				there would be a negligible adverse port utilization impact on land use and coastal infrastructure from construction and installation of offshore elements of the Proposed Action. Alternatives C through F would slightly reduce impacts to port utilization due to reduction of the number of WTGs and possible reduction of miles of IAC. However, impacts would be similar to the Proposed Action: **negligible** adverse. Offshore O&M facilities would include the RWEC, IAC, OSS interconnection cable, and OSS electrical components. While these offshore components would tie into onshore Project components that could affect land use, the offshore activities and facilities themselves would not directly impact land use. Offshore facilities that tie into onshore facilities could result in increased activity within any of the listed onshore port areas zoned for business and industrial uses. However, this would reinforce the designated land use and provide a source of investment in the coastal infrastructure. Activities at ports, as in the preceding paragraph, would be consistent with the existing and designated uses at other ports and would comply with local zoning and land use regulations. Therefore, there would be a long-term **minor** beneficial and a **negligible** adverse port utilization impact on land use and coastal infrastructure from O&M and decommissioning of offshore elements of the Proposed Action. Impacts would be similar for Alternatives C through F, although slightly reduced, so the impact determination would be the same as the Proposed Action. Port upgrades and vessel activity associated with the Proposed Action could result in incremental impacts through an increase in economic and employment opportunities as well as reduced port access, increased delays and congestion, or increased collision risk. Project port activity and upgrades (via dredging and in-water work) could also coincide with other forecasted projects. Quonset Point is scheduled to undergo remediation at the former NIKE Battery PR-58 and Disaster Village Training Area in 2021.	

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				In late 2020, the Rhode Island congressional delegation and the general treasurer joined the Rhode Island Department of Environmental Management in launching a $5.2 million project to make improvements at the Port of Galilee. The project would be located at the North Bulkhead section of the port where heavy-duty commercial fishing piers would be demolished and replaced, bulkhead asphalt repaired, and electrical supply upgraded (Block Island Times 2020). If the Port of Galilee is chosen to support Revolution Wind O&M activities, there would be no Project-related upgrades at the Port of Galilee. Port Jefferson has completed a master plan and an upper port revitalization plan, which is a blight study and urban renewal plan pursuant to New York State law. It involved rezoning certain areas and supporting major housing and mixed-use projects within the town (Village of Port Jefferson 2019). No specific non-Project improvements are proposed for Montauk Harbor, but NYSERDA issued an OSW master plan that notes Montauk Harbor as having the potential to be used or developed into facilities capable of supporting OSW projects (NYSERDA 2017). Port activities could be delayed or area transportation routes could experience longer delays as a result of the overlap in construction activities. All activities would, however, be in accordance with land use goals and plans and would be subject to local land use and zoning regulations. Construction and operations improvements associated with the Project and other OSW energy development would occur within the boundaries of existing port facilities or repurposed industrial facilities, would be similar to existing activities at the existing ports, and would support state strategic plans and local land use goals for development of waterfront infrastructure as well as economic opportunities (see Section 3.11). State and local agencies would also be responsible for minimizing the impacts of these future development plans by ensuring continued access to ports and adjacent land	

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				uses and minimizing or avoiding noise, air quality, and other impacts on nearby neighborhoods. Therefore, when considered in combination with past, present, and other reasonably foreseeable projects, the Proposed Action would have **negligible** adverse cumulative impacts on land use and coastal infrastructure. Alternatives C through F would slightly reduce impacts to port utilization, but impacts would remain the same as the Proposed Action: **negligible** adverse.	
				Onshore: The Project is evaluating the use of the Port of Davisville at Quonset Point, Port of Galilee, Port Jefferson, and Port of Montauk to support O&M of the Project (see Table 3.3-24 in the COP). O&M buildings at or near some or all of these ports would be used for wind farm monitoring and equipment storage for multiple OSW projects—the RWF, SFWF, and Sunrise Wind Farm—and as such have utility that is independent of the Project. If the Port of Galilee or Port of Brooklyn are chosen as O&M facility locations, use of these ports would be limited to existing facilities maintained by these ports. Use of the other ports listed above would include using existing facilities as well as constructing additional facilities to support the RWF and other wind farms. An existing upland building, called the Research Way O&M Building, is located approximately 6 miles from Port Jefferson at 22 Research Way in Setauket-East Setauket, New York. It is located within an office park that also hosts technology companies and health care providers among other businesses. The building was recently purchased by Northeast Offshore, LLC, and internal upgrades to establish office and warehouse space are planned. The planned work requires no governmental authorizations other than local building permits and would consist entirely of interior renovations to create workspaces. No external modifications or expansions are planned other than any necessary repairs to maintain the existing external appearance.	**Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. Construction and installation of Alternative G onshore components would be identical to the Proposed Action and would have **minor** beneficial impacts to land use and coastal infrastructure. There would be a long-term **minor** beneficial and a **negligible** adverse port utilization impact on land use and coastal infrastructure from O&M and decommissioning of onshore elements of Alternative G. Development of an OSW industry on the Mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Therefore, cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **negligible** adverse on port utilization for Alternative G.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				The only other external planned work being discussed is maintenance of the parking lot, landscaping, and, potentially, signage. The Research Way facility would also be capable of serving multiple projects as well as general Orsted and Eversource business needs. A new building with up to 1,000 square feet of office space and up to 6,000 square feet of equipment storage would be constructed at the Port of Montauk. This facility could also serve as an O&M base for multiple OSW projects. The ports under consideration for construction staging are industrial in character, designated by local zoning and land use plans for heavy industrial activity, and typically adjacent to other industrial or commercial land uses and major transportation corridors. Activities associated with onshore construction of the Project would generate noise, vibration, and vehicular traffic and would temporarily alter views at one or more ports listed in Table 3.3.10-1 of the COP. Port improvements would result in combustion emissions from construction vehicles and equipment and could result in fugitive particulate emissions from soil movement. These impacts would be typical for construction in and operation of industrial ports. Noise, vibration, vehicular traffic increases, and vehicular emission generation would be short term. Potential landside transportation impacts would be minimized through construction hour restrictions, improvements such as road widening and signalization, and appropriate route selection (BOEM 2016). Activity and development from the Project would not occur at levels above those typically experienced or expected at these facilities, would not hinder other nearby land use or use of coastal infrastructure, and would comply with local land use and zoning regulations. Overall, construction and installation of onshore components would have **minor** beneficial impacts to land use and coastal infrastructure by supporting designated uses at ports and port improvements and/or	

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				redevelopment. Improvements such as road widening and signalization would provide transportation flow benefits over the long term. the Proposed Action and Alternatives C through F include identical onshore facilities and activities and impacts. Project O&M would involve routine daily activities at O&M facilities that are consistent with the zoned uses for those specific parcels. O&M facilities would include offices, warehouses, and associated accessory uses, which are consistent with the range of land uses associated with the ports listed in Table 3.3.10-1 of the COP. The increased activity within any of the listed port areas zoned for business and industrial uses would reinforce the designated land use and provide a source of investment in the coastal infrastructure. O&M activities would be limited to temporary, periodic use of vehicles and equipment; associated impacts would be consistent with zoned and designated uses for commercial and industrial port facilities. The presence of O&M facilities and related O&M activities would contribute to the economic vitality of ports. O&M of onshore components would therefore have minor beneficial impacts to land use and coastal infrastructure by supporting designated uses at ports and supporting port improvements and/or redevelopment that would benefit other projects and port uses beyond those necessary for the Project (see Section 3.11). Therefore, there would be a long-term **minor** beneficial and a **negligible** adverse port utilization impact on land use and coastal infrastructure from O&M and decommissioning of onshore elements of the Proposed Action and Alternatives C through F. Development of an OSW industry on the Mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Potential future activities could include upgrades to port facilities that would have long-term beneficial impacts to other users over a long time period. All future port improvements would be subject to	

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				independent environmental permitting and regulatory review and are not part of the Project. Therefore, cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **negligible** adverse on port utilization for the Proposed Action and Alternatives C through F.	
Presence of structures: Viewshed	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA, which are visible from some coastal locations in New York, Connecticut, Rhode Island, and Massachusetts.	Non-OSW structures that could be viewed in conjunction with the offshore components would be limited to met towers. Marine activity would also occur within the offshore viewshed.	Future OSW activities would add 3,088 additional structures within the GAA. Future OSW activities would also result in onshore placement of structures. Structures would be built in accordance with state and local land use, zoning, and building regulations and therefore would have minimal land use and coastal infrastructure impacts. While the presence of additional onshore structures could impact land uses by reducing the amount of land available for other uses and generating short-term construction impacts, all structures would be built in accordance with state and local zoning and building regulations and would therefore have a minimal impact on land use and coastal infrastructure. On this basis, the effects of the presence of structures on land use under the No Action Alternative would be long term **negligible** adverse.	**Offshore:** The installation and operation of up to 102 offshore structures for the Proposed Action and construction of the IAC, OSS-link cable, and RWEC would not result in any impacts to land use and coastal infrastructure because these impacts would occur offshore and would not overlap with onshore land uses. Therefore, there would be a **negligible** adverse impact from the presence of structures on land use and coastal infrastructure from O&M and decommissioning of offshore elements of the Proposed Action and Alternatives C through F. Similarly, when considered in combination with past, present, and other reasonably foreseeable projects, the Proposed Action would have no effect on land use and coastal infrastructure; therefore, the cumulative impact would be **negligible** adverse. Alternatives C through F would result in incrementally smaller impacts, but not measurably reduce land use and coastal infrastructure impacts compared to the Proposed Action.	**Offshore:** The installation and operation of up to 67 offshore structures for Alternative G and construction of the IAC, OSS-link cable, and RWEC would not result in any impacts to land use and coastal infrastructure because these impacts would occur offshore and would not overlap with onshore land uses. Therefore, there would be a **negligible** adverse impact from the presence of structures on land use and coastal infrastructure from O&M and decommissioning of offshore elements of Alternative G. Similarly, when considered in combination with past, present, and other reasonably foreseeable projects, Alternative G would have no effect on land use and coastal infrastructure; therefore, the cumulative impact would be **negligible** adverse.
				Onshore: Onshore structures that would be constructed as part of the Project include the onshore transmission cable, ICF, and OnSS. The OnSS would require temporary disturbance (construction footprint) of up to 7.1 acres to facilitate construction. This includes an operational footprint of 3.8 acres. The ICF would require a temporary construction footprint of approximately 4.0 acres, which includes the 1.6-acre operational footprint. The ICF would be constructed adjacent to the existing Davisville Substation, in the zoned Quonset Business Park District. Installation of	Similar impacts to the Proposed Action and Alternatives C through F. Therefore, the presence of structures would result in a **negligible** adverse impact on land use and coastal infrastructure.

Associated IPFs: Sub-IPFs	**Ongoing Activities***	**Future Non–Offshore Wind Activities Intensity/Extent**	**Future Offshore Wind Activities Intensity/Extent**	**Proposed Action and Alternatives C through F**	**Alternative G (Preferred Alternative)**
				the ICF could increase visibility of the existing substation to nearby residences along Camp Avenue. However, construction would take place adjacent to the existing Davisville Substation, in lots surrounded by mature trees. Construction activities associated with onshore facilities is expected to take approximately 1 year and includes clearing and grading, excavating, installing foundations, and constructing the facility. There are no nighttime visually sensitive areas (public parks, beaches, or other public recreational facilities) near the OnSS and ICF that would be impacted by nighttime construction lighting (see Section 3.20). The visual impacts of the ICF would be minimized through the installation of vegetation to provide year-round screening from nearby Camp Avenue, Circuit Drive, and Roger Williams Way; appropriate substation siting; low-profile design; and minimal lighting, all of which would be directed downward (VHB 2023c). As designed, the interconnection facility would generate sound below existing, ambient sound levels (VHB 2023b). According to federal, state, and local noise standards, there would be no impact as a result of the operation of the ICF. All Project-related construction would take place within areas zoned for industrial and commercial development and would be subject to land use and zoning regulations that limit impacts. Therefore, the presence of structures would result in a **negligible** adverse impact on land use and coastal infrastructure from construction and installation of onshore elements of all Project alternatives. O&M activities would include periodic inspections and repairs at the ICF and cable access manholes, which would require minimal use of worker vehicles and construction equipment. Periodic maintenance and repairs would have temporary impacts on access to adjacent land uses. All onshore structures that are part of the Proposed Action and Alternatives C through F and any necessary modifications to structures would be consistent with land	

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				use and zoning regulations. Therefore, the impact from the presence of structures on land use and coastal infrastructure would be **negligible** adverse. Reasonably foreseeable future actions would have similar impacts to the Proposed Action and Alternatives C through F in terms of the presence of structures. Therefore, cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **negligible** adverse on land use and coastal infrastructure for all Project alternatives.	

* Includes all constructed and permitted COP projects within the land use and coastal infrastructure GAA: Block Island, SFWF, Vineyard Wind 1, and Coastal Virginia Offshore Wind.

Navigation and Vessel Traffic

No IPFs with solely negligible impacts were identified.

Table E2-14. Summary of Activities and the Associated Impact-Producing Factors for Navigation and Vessel Traffic

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Anchoring	Constructed and permitted OSW COP projects are introducing an estimated 943 acres of anchoring in the GAA. Larger commercial vessels (specifically tankers) also 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 could 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 a moderate increase commensurate with any increase in tankers visiting ports. Deep draft vessel visits to major port visits are expected to increase as well, increasing the potential for an emergency need to anchor and creating navigational hazards for other vessels. Recreational activity and commercial fishing activity would likely stay largely the same related to this IPF.	See Section 3.16.2.2.2 for analysis.	See Sections 3.16.2.3 and 3.16.2.4 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.	See Sections 3.16.2.5 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.
Port utilization: Expansion	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing	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 be able to host	See Section 3.16.2.2.2 for analysis.	See Sections 3.16.2.3 and 3.16.2.4 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.	See Sections 3.16.2.5 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	increased vessel visits, as vessel size also increases. Ports are also experiencing 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.	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	Constructed and permitted OSW COP projects are introducing 81 structures into the GAA. 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. The presence of OSW structures increases the GAA's navigational complexity, thereby increasing the risk of allision or collision. However, WTG spacing is anticipated to reduce, but not eliminate, navigational complexity.	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 35 years. Vessel allisions with non-OSW stationary objects should not increase meaningfully without a substantial increase in vessel congestion.	See Section 3.16.2.2.2 for analysis.	See Sections 3.16.2.3 and 3.16.2.4 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.	See Sections 3.16.2.5 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.
Presence of structures: Fish aggregation	Constructed and permitted OSW COP projects are introducing 81 structures into the GAA. 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 fishing near artificial reefs because 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.	See Section 3.16.2.2.2 for analysis.	See Sections 3.16.2.3 and 3.16.2.4 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.	See Sections 3.16.2.5 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.
Presence of structures: Navigation hazard	Constructed and permitted OSW COP projects are introducing 81 structures into the GAA. 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. The presence of OSW structures increases the GAA's navigational complexity, thereby increasing the risk of allision or collision. However, WTG spacing is	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 35 years. Even with increased port visits by deep draft vessels, this is still a relatively small adjustment when considering the whole of New England vessel traffic. The presence of navigation hazards is expected to continue at or near current levels.	See Section 3.16.2.2.2 for analysis.	See Sections 3.16.2.3 and 3.16.2.4 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.	See Sections 3.16.2.5 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	anticipated to reduce, but not eliminate, navigational complexity during the operations phases of the projects.				
Presence of structures: Space use conflicts	Currently, the offshore area is occupied by marine trade, stationary and mobile fishing, and survey activities. Constructed and permitted OSW COP projects are also introducing 81 structures into the GAA. The presence of OSW structures increases the GAA's navigational complexity. The attraction of artificial reef effects also increases vessel congestion and the risk of allision, collision, and spills near structures. However, WTG spacing is anticipated to reduce, but not eliminate, space-use conflicts during the operations phases of the projects.	Reasonably foreseeable activities (non–OSW) would not result in additional offshore structures.	See Section 3.16.2.2.2 for analysis.	See Sections 3.16.2.3 and 3.16.2.4 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.	See Sections 3.16.2.5 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.
New cable emplacement/ maintenance	Constructed and permitted OSW COP projects are introducing an estimated 462 miles of new offshore cable in the GAA. Within the GAA for navigation and vessel traffic, existing cables could also require access for maintenance activities. These cable activities could cause temporary increases in vessel traffic and navigational complexity.	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. 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.	See Section 3.16.2.2.2 for analysis.	See Sections 3.16.2.3 and 3.16.2.4 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.	See Sections 3.16.2.5 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.
Traffic: Aircraft, vessels, collisions	See Table E2-15 (Summary of Activities and the Associated Impact-Producing Factors for Other Marine Uses: Military and National Security Uses) for a discussion of search and rescue (SAR) aircraft and vessels with respect to traffic. SAR helicopters are the main aircraft that could 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. See also the sub-IPF for Presence of structures: Navigation hazard	SAR operations could be expected to increase with any increase in vessel traffic. As noted in Table E2-15, no future non-OSW stationary structures were identified within the offshore GAA. Therefore, because vessel traffic volume associated with future non-OSW is not expected to increase appreciably, neither should SAR operations. See also the sub-IPF for Presence of structures: Navigation hazard	See Section 3.16.2.2.2 for analysis.	See Sections 3.16.2.3 and 3.16.2.4 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.	See Sections 3.16.2.5 and Section 3.16.2.1, Table 3.16-3 for analysis of impacts.

*Includes three constructed and permitted COP projects within the navigation and vessel traffic GAA: Block Island, SFWF, Vineyard Wind 1.

Other Marine Uses: Military and National Security

Table E2-15. **Summary of Activities and the Associated Impact-Producing Factors for Other Marine Uses: Military and National Security Uses**

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases and discharges	Accidental releases and discharges of fuels and fluids have the potential to occur during vessel usage for permitted and built OSW COP projects, dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable line and pipeline laying activities.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities. Impacts are unlikely to affect military and national security uses.	Fuels and oils would be required for construction, installation, O&M, and decommissioning of future OSW activities. In the event of a spill or release during construction and installation activities, offshore water quality would be degraded. OSRPs would be required for all future OSW projects, which includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. Releases during construction of future OSW activities during all phases of project construction would generally be localized and short term, resulting in little change to water quality. Therefore, this IPF would have a **negligible** adverse impact on military and national security uses because there would be no effect on this resource.	**Offshore:** Fuels and oils would be required for offshore construction and installation equipment, vessels, and infrastructure over the 18-month construction period. In the event of a spill or release during construction and installation activities, offshore water quality would be degraded. As described in Section 3.21.1.2, the likelihood of a spill due to construction and installation activities and weather events is low (once per 1,000 years). An OSRP has been prepared for the Project and includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. Therefore, this IPF would have a **negligible** adverse impact on military and national security uses. Alternatives C through F would reduce the number of WTGs and their associated IACs, which would have an associated reduction in associated vessel and equipment use. This decrease in WTGs would result in a reduction of possible accidental releases and discharges, but the level of impact would not measurably change relative to the Proposed Action.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, this IPF would have a negligible adverse impact on military and national security uses. Alternative G would result in fewer WTGs, which would result in a reduced number of vessels and associated equipment used in construction and operations, resulting in a reduction of possible accidental releases and discharges, but would not measurably change in relation to the Proposed Action.
Anchoring	Impacts from anchoring have the potential to occur due to permitted and built OSW COP projects, ongoing military use and survey, and commercial and recreational activities. The presence of anchored construction vessels could cause military vessels to change course or otherwise alter operations and could increase demand for SAR.	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic.	See Section 3.17.2.4.2 for analysis.	See Section 3.17.2.9 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
New cable emplacement/maintenance	Constructed and permitted OSW COP projects are introducing an estimated 163 miles of new offshore cable in the GAA. This and other ongoing cable maintenance activities can cause military vessels to change course or otherwise alter operations and could increase demand for SAR; these	Cable maintenance or replacement of existing cables in the GAA would occur infrequently, and would generate short-term disturbances.	See Section 3.17.2.4.2 for analysis.	See Section 3.17.2.9 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	disturbances would be local and limited to emplacement corridors.				
Light	Constructed and permitted OSW COP projects are introducing 13 lighted structures into the GAA, as well as lighted vessels. Impacts from lighting on military and national security also include light associated with military, commercial, or construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis. Impacts are expected to be minimal.	Future activities with the potential to result in 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 growth and development over time. Light from onshore structures is expected to gradually increase in line with human population growth along the coast, with minimal offshore impacts.	See Section 3.17.2.4.2 for analysis.	See Section 3.17.2.9 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Noise	Noise impacts are expected from OSW and non-OSW construction and vessel traffic. Construction occurs frequently in nearshores 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 local and temporary. Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this IPF consist of constructed and permitted OSW COP projects, commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the GAA for this resource. Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.	While future OSW activities without the Proposed Action would result in construction and decommissioning noise and limited operational noise, noise is not expected to impact military and national security as all noise would be lower than regulatory thresholds and would occur in geographic areas in which the military does not typically operate. Therefore, the effects of noise on military and national security under the No Action Alternative would be **negligible** adverse.	**Offshore:** While construction and installation, O&M and decommissioning of offshore elements of the Proposed Action would result in construction noise, noise is not expected to impact military and national security as all noise would be lower than regulatory thresholds. Alternatives C through F would reduce the number of WTGs and their associated IACs, which would have an associated reduction in noise associated with vessel and equipment use, but otherwise, the level of impact would not measurably change relative to the Proposed Action. Therefore, the effects of noise on military and national security under the Proposed Action and Alternatives C through F would be **negligible** adverse. The Project combined with reasonably foreseeable future actions would result in an increase in construction and decommissioning noise in the RI/MA WEA. However, noise impacts would be distributed across a large geographic area and would not likely occur at the same time. Noise is not anticipated to impact military or national security. Therefore, because Project activities combined with reasonably foreseeable activities would result in a minimal increase in noise offshore that is not expected to impact military and national security uses,	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, the effects of noise on military and national security under Alternative G would be **negligible** adverse. The Project combined with reasonably foreseeable future actions would result in an increase in construction and decommissioning noise in the RI/MA WEA. However, noise impacts would be distributed across a large geographic area and would not likely occur at the same time. Noise is not anticipated to impact military or national security. Therefore, because Project activities combined with reasonably foreseeable activities would result in a minimal increase in noise offshore that is not expected to impact military and national security uses, the cumulative impacts would be **negligible** adverse.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				the cumulative impacts would be **negligible** adverse.	
Port utilization	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in navigation patterns at nearby airports. The increased activity could cause potential conflicts with military aircraft and vessels.	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 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, changes in port usage by some fishing or recreational vessel operators, and changes in navigation patterns.	There could be a very minimal increase in vessel use at ports associated with the No Action Alternative. The number of construction vessels would increase due to future OSW activities without the Proposed Action, which could result in delays and congestion at ports that could lead to potential conflicts with military aircraft and vessels due to increased activity in the vicinity of the airports listed in the Affected Environment. Port improvements and construction activities in or near ports could require alteration of navigation patterns at nearby airports, which could impact military uses. Navigational hazards and collision risks at ports and in transit routes would be reduced as construction is completed, and all navigation hazards and collision risks would be gradually eliminated during decommissioning as offshore WTGs are removed. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Therefore, port utilization is expected to have a **negligible** adverse effect on military and national security.	**Offshore:** the Proposed Action and Alternatives C through F would require construction and O&M vessels, which could result in minor delays and congestion at ports. This could lead to potential conflicts with military aircraft and vessels due to increased port activity. Although no port improvements are currently planned as part of the Proposed Action and Alternatives C through F, if port upgrades are required, port improvements and construction activities in or near ports could require alteration of navigation patterns at nearby airports, which could impact military uses. Navigational hazards and collision risks at ports and in transit routes would be reduced as construction and O&M is completed. Vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. However, port utilization is not expected to increase beyond what is currently allowed under land use regulations. Therefore, port utilization is expected to have a **negligible** adverse effect on military and national security. Although Alternatives C through F would result in a slight reduction of port utilization due to a reduction of the number of WTGs and their associated IACs, impacts on this resource would be similar to the Proposed Action. Project activities combined with reasonably foreseeable activities would result in a minimal increase in port utilization that would be accounted for through port improvements and capacity planning. Therefore, the cumulative impacts of noise on military and national security would be **negligible** adverse.	**Offshore:** Although Alternative G would result in a slight reduction of port utilization due to a reduction of the number of WTGs and their associated IACs, impacts on this resource would be similar to the Proposed Action. Project activities combined with reasonably foreseeable activities would result in a minimal increase in port utilization that would be accounted for through port improvements and capacity planning. Therefore, the cumulative impacts of noise on military and national security would be **negligible** adverse.
Presence of structures: Allisions	Constructed and permitted OSW COP projects are introducing 13 structures into the GAA. Other existing stationary facilities that present allision risks include dock facilities, meteorological buoys associated with OSW lease areas, and other offshore or shoreline-based structures. OSW project use	No additional non-OSW stationary structures were identified within the GAA. Stationary structures such as private or commercial docks could be added close to the shoreline.	See Section 3.17.2.4.2 for analysis.	See Section 3.17.2.9 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	of navigation safety zones and WTG spacing is anticipated to reduce some of the risk of collisions and allisions.				
Presence of structures: Fish aggregation	Constructed and permitted OSW COP projects are introducing 13 structures into the GAA. These stationary structures act as fish aggregating devices (FADs). These FADs can concentrate recreational and commercial fishing, which can add to conflict or collision risks for military and national security vessels and increase demand for SAR operations.	No future non-OSW additional stationary structures that would act as FADs were identified within the GAA.	See Section 3.17.2.4.2 for analysis.	See Section 3.17.2.9 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Presence of structures: Navigation hazard	Constructed and permitted OSW COP projects are introducing 13 structures into the GAA. Other existing stationary facilities within the GAA that present navigational hazards consist of communication towers; dock facilities; and other onshore and offshore commercial, industrial, and residential structures. OSW project use of navigation safety zones and WTG spacing is anticipated to reduce some of these risks to navigation.	No future non-OSW stationary structures were identified within the offshore GAA. Onshore, development activities are anticipated to continue, with additional proposed communications towers and onshore commercial, industrial, and residential developments.	See Section 3.17.2.4.2 for analysis.	See Section 3.17.2.9 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Presence of structures: Space use conflicts	Constructed and permitted OSW COP projects are introducing 13 structures into the GAA. Other existing stationary facilities within the GAA that present a navigational hazard include communication towers; dock facilities; and other onshore and offshore commercial, industrial, and residential structures. OSW project use of navigation safety zones and WTG spacing is anticipated to reduce some of these risks to navigation.	No future non-OSW stationary structures were identified within the offshore GAA. Onshore, development activities are anticipated to continue, with additional proposed communications towers and onshore commercial, industrial, and residential developments.	See Section 3.17.2.4.2 for analysis.	See Section 3.17.2.9 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Presence of structures: Transmission cable infrastructure	Seven submarine cable corridors cross cumulative lease areas. Constructed and permitted OSW COP projects are also introducing an estimated 163 miles of new offshore cable in the GAA. Cable activities could cause military vessels to change course or otherwise alter operations and could increase demand for SAR. These impacts are expected to be limited to cable emplacement corridors.	Submarine cables would remain in current locations with infrequent maintenance continuing along those cable routes for the foreseeable future.	See Section 3.17.2.4.2 for analysis.	See Section 3.17.2.9 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Traffic: Vessels, collisions	Current vessel traffic in the region is described in Section 3.16.1. Vessel activities associated with OSW in the cumulative lease areas is currently limited to site assessment	Continued vessel traffic in the region is described in Section 3.16.1.	See Section 3.17.2.4.2 for analysis.	See Section 3.17.2.9 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	surveys and constructed and permitted OSW COP projects.				
Traffic: Aviation	Onshore and offshore military and national security use areas could have designated surface and subsurface boundaries and special use airspace. Military air traffic use the area, and government and other private aircraft could occasionally fly over the WEA for data collection and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments. Warning Area W-105A is a special use airspace area primarily used by the U.S. Air Force located offshore Massachusetts and Rhode Island, and overlapping the RI and MA lease areas.	Although no future non-OSW stationary structures were identified within the offshore GAA, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non-OSW is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.	See Section 3.17.2.4.2 for analysis.	See Section 3.17.2.9 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Climate Change	Climate change has resulted in a measurable increase in annual precipitation on the East Coast, which could impact military and national security-related aviation and air traffic due to more inclement weather incidents.	Sea level rise and storm severity/frequency would increase due to the effects of climate change.	Climate change has resulted in a measurable increase in annual precipitation on the East Coast, which could impact military and national security–related aviation and air traffic due to more inclement weather incidents. Future OSW activities could result in construction activities that increase GHG emissions. Increased GHG emissions could contribute to climate change impacts during construction. However, the construction of future OSW facilities could ultimately help slow the negative effects of climate change by redistributing some of the East Coast's energy generation to renewable sources, resulting in a net decrease in GHG emissions from energy generation. On this basis, the effects of climate change on military and national security under the No Action Alternative would be **negligible** adverse.	Similar to the No Action Alternative, the construction and installation, O&M, and decommissioning of the Proposed Action and Alternatives C through F could contribute to climate change impacts during construction. However, the Project could also ultimately help slow the negative effects of climate change by redistributing some of the East Coast's energy generation to renewable sources, resulting in a net decrease in GHG emissions from energy generation. On this basis, the effects of climate change on military and national security under the Proposed Action and Alternatives C through F would be **negligible** adverse.	Similar impacts to the Proposed Action and Alternatives C through F. On this basis, the effects of climate change on military and national security under Alternative G would be **negligible** adverse.

* Includes one constructed and permitted COP project that occurs within the military and national security GAA: SFWF.

Other Marine Uses: Aviation and Air Traffic

Table E2-16. Summary of Activities and the Associated Impact-Producing Factors for Other Marine Uses: Aviation and Air Traffic

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases and discharges	Accidental releases and discharges have the potential to occur during vessel usage for permitted and built OSW COP projects,	No future activities were identified within the GAA other than ongoing activities.	Accidental releases and discharges would not overlap with aviation and air traffic uses and	**Offshore:** The effects of this IPF from the Proposed Action and Alternatives C through F would not impact aviation and air traffic	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable line and pipeline laying activities. These activities do not overlap with aviation and air traffic uses and areas.		areas and therefore would result in a **negligible** adverse impact.	because accidental releases and discharges would not overlap with aviation and air traffic uses. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource. **Onshore:** Same as offshore impacts.	because there would be no effect on this resource. **Onshore:** Same as offshore impacts.
Anchoring and new cable emplacement/maintenance	Anchoring activities have the potential to occur due to permitted and built OSW COP projects, ongoing military use and survey, and commercial and recreational activities. These activities do not overlap with aviation and air traffic uses and areas.	No future activities were identified within the GAA other than ongoing activities.	Future OSW activities would require adding new cables and maintaining them as part of future wind projects. The offshore effects of anchoring and new cable emplacement/maintenance would have no bearing on aviation or air traffic, as these uses do not overlap. Onshore construction and maintenance of cables associated with future OSW activities would occur in areas that are not likely to overlap with aviation uses. The use of onshore construction equipment would not interfere with air traffic. On this basis, the effects of anchoring and new cable emplacement/maintenance on aviation and air traffic under the No Action Alternative would be **negligible** adverse.	**Offshore:** Onshore construction, maintenance, and decommissioning of cables associated with future OSW activities would occur in areas that are not likely to overlap with aviation uses. The use of onshore construction equipment would not interfere with air traffic. On this basis, the effects of anchoring and new cable emplacement/maintenance on aviation and air traffic under the Proposed Action and Alternatives C through F would be **negligible** adverse. **Onshore:** Same as offshore impacts.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. On this basis, the effects of anchoring and new cable emplacement/maintenance on aviation and air traffic under Alternative G would be **negligible** adverse. **Onshore:** Same as offshore impacts.
Light	Constructed and permitted OSW COP projects are introducing 81 lighted structures into the GAA, as well as lighted vessels. Other impacts from lighting on aviation and air traffic include light associated with non-OSW military, commercial, or construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis. Impacts are expected to be minimal.	Future activities with the potential to result in lighting impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities. Light pollution from vessel traffic would continue at the current intensity along the Northeast coast, with a slight increase due to population increase and development over time. Light from onshore structures is expected to gradually increase in line with human population growth along the coast, with minimal offshore impacts.	See Section 3.17.2.2.2 for analysis.	See Section 3.17.2.7 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Noise	Noise impacts are expected from OSW and non-OSW construction and vessel traffic. Construction occurs frequently in nearshores of populated areas in New England and the Mid-Atlantic but infrequently offshore. Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this IPF consist of	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the GAA for this resource. Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.	While future OSW activities without the Proposed Action would result in construction and decommissioning noise and limited operational noise, noise is not expected to impact aviation and air traffic. Therefore, the effects of noise on aviation and air traffic under the No Action Alternative would be **negligible** adverse.	**Offshore:** All Project-associated noise would comply with regulatory noise thresholds and noise is not expected to impact aviation and air traffic. Alternatives C through F could result in a slight reduction to construction and operational noise but otherwise would be similar to the Proposed Action. Therefore, the effects of noise on aviation and air traffic	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, the effects of noise on aviation and air traffic under Alternative G would be **negligible** adverse. Reasonably foreseeable future actions would occur over a dispersed geographic area and would not generate noise high enough to

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	constructed and permitted OSW COP projects, commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Noise is not expected to impact aviation and air traffic.			under the Proposed Action and Alternatives C through F would be **negligible** adverse. Reasonably foreseeable future actions would occur over a dispersed geographic area and would not generate noise high enough to impact aviation uses. Therefore, the cumulative impacts would also be **negligible** adverse.	impact aviation uses. Therefore, the cumulative impacts would also be **negligible** adverse.
				Onshore: There would be onshore noise impacts associated with the construction of Alternatives B through F. Construction would be limited to daylight hours, and noise impacts would consist of noise generated from heavy equipment performing clearing, grading, excavating, installing foundations, and heavy lifting of substation components. Noise modeling shows that noise is expected to remain below Town of North Kingstown noise ordinance levels. Because there is no permanent noise-generating equipment associated with the onshore transmission cable, operational noise of the underground cables is expected to have no impacts to aviation and air traffic. The OnSS and ICF, as designed, would generate sound similar to or below existing ambient sound levels; therefore, operational noise levels would not have an impact on aviation and air traffic. It is expected that reasonably foreseeable future actions would have similar noise impacts to the Proposed Action and Alternatives C through F. Therefore, impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **negligible** adverse on aviation and air traffic.	**Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **negligible** adverse on aviation and air traffic.
Port utilization	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in navigation patterns at nearby airports. The increased activity could	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 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 navigation patterns at nearby airports.	See Section 3.17.2.2.2 for analysis.	See Section 3.17.2.7 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	cause potential impacts to aviation and air traffic.				
Presence of structures: Navigation hazard	Constructed and permitted OSW COP projects are introducing 81 structures into the GAA. Other existing aboveground stationary facilities within the GAA that present navigational hazards include communication towers, dock facilities, and other onshore and offshore structures exceeding 200 feet in height. The addition of these structures increases navigational complexity and may change aircraft navigation patterns for aircraft flying at low altitudes and for airports in the vicinity, increasing collision risks for some aircraft. However, more than 90% of existing air traffic in the GAA would occur at altitudes that would not be impacted by the presence of WTGs.	No future non-OSW stationary structures were identified within the offshore GAA. Onshore development activities are anticipated to continue with additional proposed communications towers.	See Section 3.17.2.2.2 for analysis.	See Section 3.17.2.7 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Presence of structures: Space use conflicts	Constructed and permitted OSW COP projects are introducing 81 structures into the GAA. Other existing aboveground stationary facilities within the GAA that could cause space use conflicts for aircraft consist of communication towers, and other onshore and offshore structures exceeding 200 feet in height. Impacts would be as described for Presence of structures: Navigation hazard.	No future non-OSW stationary structures were identified within the offshore GAA. Onshore, development activities are anticipated to continue with additional proposed communications towers.	See Section 3.17.2.2.2 for analysis.	See Section 3.17.2.7 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Traffic: Aviation	Onshore and offshore military and national security use areas could have designated surface and subsurface boundaries and special use airspace. Military air traffic use the area, and government and other private aircraft could occasionally fly over the WEA for data collection and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments. Warning Area W-105A is a special use airspace area primarily used by the U.S. Air Force located offshore Massachusetts and Rhode Island, and overlapping the RI and MA lease areas.	Although no future non-OSW stationary structures were identified within the offshore GAA, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non-OSW is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.	See Section 3.17.2.2.2 for analysis for offshore impacts. This IPF would not impact onshore uses.	See Section 3.17.2.7 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts for offshore impacts. This IPF would not impact onshore uses.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Traffic: Vessels	Current vessel traffic in the region is described in Section 3.16.1. The GAA would continue to have numerous ports, and the extensive marine traffic related to constructed and permitted OSW COP	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 30 years. Even with increased	See Section 3.17.2.2.2 for analysis.	See Section 3.17.2.7 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	projects, shipping, fishing, and recreation would continue to be important to the region's economy.	port visits by deep draft vessels and consistent generation of new vessel traffic by proposed barge routes and dredging demolition sites, this is still a relatively small adjustment when considering the whole of New England vessel traffic.			
Climate change	Climate change has resulted in a measurable increase in annual precipitation on the East Coast, which could impact military and national security–related aviation and air traffic due to more inclement weather incidents.	Sea level rise and storm severity/frequency would increase due to the effects of climate change.	Future OSW activities could result in construction activities that increase GHG emissions. Increased GHG emissions could contribute to climate change impacts. Climate change has resulted in a measurable increase in annual precipitation on the East Coast, which could impact aviation and air traffic due to more inclement weather incidents. However, the construction of future OSW facilities would ultimately help slow the negative effects of climate change by redistributing some of the East Coast's energy generation to renewable sources. On this basis, the effects of climate change on aviation and air traffic under the No Action Alternative would be **negligible** adverse.	**Offshore:** the Proposed Action and Alternatives C through F could result in GHG emissions during Project construction, O&M, and decommissioning phases as well as offset negative effects of climate change by redistributing some of the East Coast's energy generation to renewable sources. Therefore, the effects of climate change on aviation and air traffic under Alternatives C through F would be **negligible** adverse. **Onshore:** Same as offshore impacts.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, the effects of climate change on aviation and air traffic under Alternative G would be **negligible** adverse.

* Includes three constructed and permitted COP projects within the aviation and air traffic GAA: Block Island, SFWF, and Vineyard Wind 1.

Other Marine Uses: Undersea Cables

Table E2-17. Summary of Activities and the Associated Impact-Producing Factors for Other Marine Uses: Undersea Cables

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases and discharges	Accidental releases and discharges of fuels and fluids have the potential to occur during vessel usage for permitted and built OSW COP projects, dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable line and pipeline laying activities.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities.	The effects of this IPF from the No Action Alternative would not impact undersea cables because accidental releases and discharges would result in water quality impacts that do not impact undersea cables. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore:** The effects of this IPF from the Proposed Action and Alternatives C through F would not impact undersea cables because accidental releases and discharges would result in water quality impacts that do not impact undersea cables. Alternatives C through F would require fewer construction, O&M, and decommissioning vessel trips, reducing the risk of accidental releases and discharges, but there would be no measurable change on effects between all Project alternatives. Therefore, this IPF would result in a **negligible** adverse impact and **negligible** adverse cumulative impact under the Proposed Action and Alternatives C through F because there would be no effect on this resource.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Therefore, this IPF would result in a **negligible** adverse impact and **negligible** adverse cumulative impact under Alternative G because there would be no effect on this resource.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				Onshore: Same as offshore impacts.	**Onshore:** Same as offshore impacts.
Anchoring and new cable emplacement/maintenance	Impacts from this IPF have the potential to occur due to permitted and built OSW COP projects, ongoing military use and survey, commercial, and recreational activities. These disturbances would be limited to local areas. Any cable crossings are anticipated to include mapping and installation of cable protection at the crossing location, as well as standard design techniques for undersea cable installation.	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Cable emplacement/maintenance would be infrequent and short term.	The presence of future OSW energy cables could preclude future submarine cable placement within any given development footprint, requiring future cables to route around these areas. However, the placement and presence of these cables would not prohibit the placement of additional cables and pipelines. Following standard industry procedures, cables and pipelines can be crossed without adverse impacts. The risk of allision to cable maintenance vessels could increase as more OSW energy projects are constructed. However, given the infrequency of required maintenance at any given location along a cable route, this risk is expected to be low. Impacts on submarine cables would be eliminated during decommissioning of OSW farms if export cables associated with those projects are removed. Therefore, the effects of anchoring and new cable emplacement/maintenance on undersea cables under the No Action Alternative would be **negligible** adverse.	**Offshore:** The installation of the RWEC would cross submarine cables that run through the regional waters. Most submarine cables pass through Green Hill, Rhode Island. In addition, there are NOAA nautical chart cable and pipeline areas that denote where such infrastructure could be located. Because Revolution Wind would use standard techniques during installation, O&M, and decommissioning to prevent damage to cables, adverse impacts would be **negligible** adverse. The effects of this IPF would be the same or slightly reduced from the Proposed Action under Alternatives C through F. Up to 13,469 miles of cables are expected to be installed between 2021 and 2030 in the RI/MA WEA as part of reasonably foreseeable future actions. However, the placement and presence of these cables would not prohibit the placement of additional cables and pipelines. Impacts on undersea cables would be eliminated during decommissioning of OSW farms if export cables associated with those projects are removed. Therefore, Project activities combined with reasonably foreseeable activities would result in a **negligible** adverse impact on undersea cables.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F: impacts would be **negligible** adverse. The effects of this IPF would be the same or slightly reduced from the Proposed Action under Alternative G. Impacts on undersea cables would be eliminated during decommissioning of OSW farms if export cables associated with those projects are removed. Therefore, Project activities combined with reasonably foreseeable activities would result in a **negligible** adverse impact on undersea cables.
				Onshore: Same as offshore impacts.	**Onshore:** Same as offshore impacts.
Light	Constructed and permitted OSW COP projects are introducing 13 lighted structures into the GAA, as well as lighted vessels. Impacts from lighting also include light associated with military, commercial, or construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Impacts are expected to be minimal.	Future activities with the potential to result in 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.	Future OSW activities without the Proposed Action would result in an increase in permanent aviation warning lighting on WTGs offshore. All existing stationary structures would have navigation marking and lighting in accordance with FAA, USCG, and BOEM guidance to minimize allision risks. Implementation of navigational lighting and marking per FAA and BOEM requirements and guidelines would further reduce the risk of vessel collisions during installation or maintenance of undersea cables. This would result in a general increase of lights in the GAA, which could have a small negative impact on vessels performing cable construction or maintenance by increasing	**Offshore:** Lighting for construction, operations, and decommissioning under all Project alternatives would not impact undersea cables because light has no impact on undersea cables. Alternatives C through F would result in smaller Project footprints and fewer lighted offshore structures than the Proposed Action, but the reduction of impacts would not be measurable. This IPF would result in **negligible** adverse impacts because there would be no effect on this resource. **Onshore:** Same as offshore impacts.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in **negligible** adverse impacts because there would be no effect on this resource. **Onshore:** Same as offshore impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
			navigational complexity. However, given that no new cables associated with non–wind energy actions are anticipated, the effects of light on undersea cable construction or maintenance under the No Action Alternative would be **negligible** adverse.		
Noise	Ongoing noise from OSW and non-OSW construction occurs frequently nearshores of populated areas in New England and the Mid-Atlantic but infrequently offshore. Noise from construction near shorelines is expected to gradually increase over the next 30 years in line with human population growth along the coast of the GAA.	No future activities were identified within the GAA other than ongoing activities.	The effects of this IPF from the No Action Alternative would not impact undersea cables because noise has no impact on existing undersea cables or the construction or maintenance of undersea cables. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore:** Project construction, operations, and decommissioning noise would not impact undersea cables because noise has no impact on undersea cables. Alternatives C through F would result in smaller Project footprints and fewer offshore structures than the Proposed Action, but the reduction of impacts would not be measurable. This IPF would result in **negligible** adverse impacts because there would be no effect on this resource.	**Offshore:** Project construction, operations, and decommissioning noise would not impact undersea cables because noise has no impact on undersea cables. Alternative G would result in smaller Project footprints and fewer offshore structures than the Proposed Action, but the reduction of impacts would not be measurable. This IPF would result in **negligible** adverse impacts because there would be no effect on this resource.
				Onshore: Same as offshore impacts.	**Onshore:** Same as offshore impacts.
Port utilization	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in port usage. The increased activity could cause potential navigational complexity.	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 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.	There could be a very minimal increase in vessel use at ports associated with the No Action Alternative. Vessels used for undersea cable installation and maintenance of existing or future non–wind energy cables could conflict with vessels used for construction, O&M and decommissioning of future OSW actions by increasing congestion and delays at ports. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Port utilization is also not expected to increase beyond what is currently allowed under land use regulations; therefore, port utilization that supports future OSW activities would not impact the construction, operation, and maintenance of existing and future undersea cables. Therefore, there would be **negligible** adverse impacts from increased port utilization for the construction, operation, and maintenance of existing and future undersea cables.	**Offshore:** Vessels used for the Project could impact installation and O&M of other undersea cables by increasing congestion and delays at ports. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Port utilization is also not expected to increase beyond what is currently allowed under land use regulations; therefore, port utilization that supports the Proposed Action and Alternatives C through F would have **negligible** adverse impacts on existing and future undersea cables.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F; therefore, port utilization that supports Alternative G would have **negligible** adverse impacts on existing and future undersea cables.
				Onshore: Same as offshore impacts.	**Onshore:** Same as offshore impacts.
Presence of structures: Allisions and navigation hazards	Constructed and permitted OSW COP projects are introducing 13 structures into the GAA. Other existing structures within and near the GAA that pose potential allision hazards include met buoys associated with OSW lease areas; and shoreline	Reasonably foreseeable non-OSW structures that could affect submarine cables have not been identified in the GAA.	See Section 3.17.2.6.2 for analysis.	See Section 3.17.2.11 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.21 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	developments such as docks, ports, and other commercial, industrial, and residential structures. Current activities could preclude future submarine cable placement in the GAA, although there are no known future cables identified to be placed within this area. Additionally, ongoing vessel traffic represents a risk for allisions with vessels used for construction of undersea cables.				
Presence of structures: Space use conflicts	Submarine cables cross the GAA and are associated with a larger network of submarine cables that are present along the OCS. Constructed and permitted OSW COP projects are also introducing 13 structures into the GAA. Current activities could preclude future submarine cable placement in the GAA, although there are no known future cables identified to be placed within this area.	Reasonably foreseeable non-OSW structures have not been identified in the GAA.	See Section 3.17.2.6.2 for analysis.	See Section 3.17.2.11 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.21 for analysis of impacts.
Presence of structures: Transmission cable infrastructure	Seven submarine cable corridors cross cumulative lease areas. Constructed and permitted OSW COP projects are also introducing an estimated 163 miles of new offshore cable in the GAA. Current activities could preclude future submarine cable placement in the GAA, although there are no known future cables identified to be placed within this area.	Reasonably foreseeable non-OSW structures have not been identified in the GAA.	See Section 3.17.2.6.2 for analysis.	See Section 3.17.2.11 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.21 for analysis of impacts.
Traffic: Aviation	Military air traffic use the area, and government and other private aircraft could occasionally fly over the WEA for data collection and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments.	Although no future non-OSW stationary structures were identified within the offshore GAA, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non-OSW is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.	Future OSW activities could result in increased air traffic due to the use of helicopters and other aircraft during construction, installation, O&M, and decommissioning of future wind projects. While the exact increase in future project-related flights is unknown, it is anticipated that future OSW activities would result in a small increase in flight traffic. Future OSW projects would be required to engage the FAA in flight planning to avoid impacts to civilian, commercial, government, and military aviation operations. With implementation of FAA-approved flight plans, impacts of the No Action Alternative on undersea cables would be **negligible** adverse.	**Offshore:** Aviation and air traffic impacts from offshore construction, O&M, and decommissioning of the Project would not coincide with areas in which undersea cables are located. While Alternatives C through F would require fewer Project-related helicopter trips due to the reduction in number of offshore elements, the effects of this IPF on undersea cables and pipelines would be **negligible** adverse under all Project alternatives.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. Although Alternative G would require fewer Project-related helicopter trips due to the reduction in number of offshore elements, the effects of this IPF on undersea cables and pipelines would be **negligible** adverse under all Project alternatives.
				Onshore: Same as offshore impacts.	**Onshore:** Same as offshore impacts.
Traffic: Vessels	Current vessel traffic in the region is described in Section 3.16.1. The GAA would continue to have numerous ports, and the	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not	See Section 3.17.2.6.2 for analysis.	See Section 3.17.2.11 and Section 3.17.2.1, Table 3.17-1 for analysis of impacts.	See Section 3.17.2.21 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	extensive marine traffic related to constructed and permitted OSW COP projects, shipping, fishing, and recreation would continue to be important to the region's economy. Ongoing vessel traffic could lead to course changes of vessels used for undersea cable maintenance and installation and increased traffic along vessel transit routes.	anticipate vessel traffic to greatly increase over the next 30 years. Even with increased port visits by deep draft vessels and consistent generation of new vessel traffic by proposed barge routes and dredging demolition sites, this is still a relatively small adjustment when considering the whole of New England vessel traffic.			
Climate change	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters and sea level rise.	No future activities were identified within the GAA other than ongoing activities.	The effects of this IPF from the No Action Alternative would not impact undersea cables because undersea cables and cable placement are not impacted by ongoing or future climate change impacts. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore:** The impacts of this IPF would not impact undersea cables for the Proposed Action and Alternatives C through F because climate change impacts do not have a measurable effect on undersea cables. This IPF would result in **negligible** adverse impacts because there would be no effect on this resource.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in **negligible** adverse impacts because there would be no effect on this resource.
				Same as offshore impacts.	Same as offshore impacts.

* Includes one constructed and permitted COP project within the undersea cables GAA: SFWF.

Other Marine Uses: Land-Based Radar

Table E2-18. Summary of Activities and the Associated Impact-Producing Factors for Other Marine Uses: Land-Based Radar

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases and discharges	Accidental releases and discharges of fuels and fluids have the potential to occur during vessel usage for permitted and built OSW COP projects, dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable line and pipeline laying activities.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities.	The effects of this IPF from the No Action Alternative would not impact land-based radar because accidental releases and discharges would be limited in scope to the offshore and onshore areas occupied by future OSW activities and would not result in increased radar interference. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore:** The effects of this IPF from the Proposed Action and Alternatives C through F would not impact land-based radar because accidental releases and discharges from the Project would be limited to the areas in which construction, O&M, and decommissioning are taking place and would not be located near land-based radar systems, nor would land-based radar systems be affected by accidental releases and discharges. While Alternatives C through F would require fewer Project-associated vessel trips, incrementally reducing the risk of accidental releases and discharges, the effects under all Project alternatives would be similar. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore: S**imilar impacts to the Proposed Action and Alternatives C through F. Although Alternative G would require fewer Project-associated vessel trips, incrementally reducing the risk of accidental releases and discharges, the effects under all Project alternatives would be similar. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.
				Onshore: Same as offshore impacts.	**Onshore:** Same as offshore impacts.

Associated IPFs: Sub-IPFs	**Ongoing Activities***	**Future Non–Offshore Wind Activities Intensity/Extent**	**Future Offshore Wind Activities Intensity/Extent**	**Proposed Action and Alternatives C through F**	**Alternative G (Preferred Alternative)**
Anchoring and new cable emplacement/maintenance	Impacts from this IPF have the potential to occur due to permitted and built OSW COP projects, to ongoing military use and survey, commercial, and recreational activities. These disturbances would be limited to local areas and are not expected to increase radar interference.	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Cable emplacement/maintenance would be infrequent and short term.	Offshore energy facility new cable emplacement and maintenance of cables would involve increased vessel traffic, which could create increased radar interference. However, the impacts are expected to be small and short term because anchoring and cable emplacement/maintenance activities are short-term activities that require few vessels. On this basis, the effects of anchoring and new cable emplacement/maintenance on land-based radar under the No Action Alternative would be **negligible** adverse.	**Offshore:** Cable construction associated with the Proposed Action and Alternatives C through F could result in increased vessel traffic, which could create increased radar interference. However, the impacts are expected to be small and short term in duration because anchoring and cable emplacement activities are short term and infrequent activities that require few vessels. Impacts under Alternatives C through F would be slightly reduced due to smaller Project footprints and fewer offshore structures, but effects would be similar under all Project alternatives. On this basis, the effects of anchoring and new cable emplacement/maintenance on land-based radar under the Proposed Action and Alternatives C through F during Project construction, O&M, and decommissioning would be **negligible** adverse. Up to 2,961 acres could be affected by anchoring/mooring activities during OSW energy development within the GAA in addition to the Proposed Action and Alternatives C through F. However, the impacts are expected to be small and short term. Therefore, the cumulative impacts associated with the Proposed Action and Alternatives C through F when combined with past, present, and reasonably foreseeable activities would be similar to those impacts described under the No Action Alternative and would be **negligible** adverse. **Onshore:** Same as offshore impacts.	**Offshore: S**imilar impacts to the Proposed Action and Alternatives C through F. On this basis, the effects of anchoring and new cable emplacement/maintenance on land-based radar under Alternative G during Project construction, O&M, and decommissioning would be **negligible** adverse. Up to 2,093 acres could be affected by anchoring/mooring activities during OSW energy development within the GAA under Alternative G. However, the impacts are expected to be short term. Therefore, the cumulative impacts of Alternative G when combined with past, present, and reasonably foreseeable activities would be similar to those impacts described under the Proposed Action and would be **negligible** adverse. **Onshore:** Same as offshore impacts.
Light	Constructed and permitted OSW COP projects are introducing 81 lighted structures into the GAA, as well as lighted vessels. Other impacts from lighting include light associated with military, commercial, or construction vessel traffic but are not expected to result in radar interference.	No future activities were identified within the GAA other than ongoing activities.	The effects of this IPF from the No Action Alternative would not impact land-based radar because light from future OSW activities would not affect radar systems. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore:** Light from construction, O&M, and decommissioning of the Proposed Action and Alternatives C through F would not affect radar systems. This IPF would result in a **negligible** adverse effect on the operation and effectiveness of land-based radar systems because there would be no effect on this resource. The cumulative effects of this IPF do not impact land-based radar and are therefore **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and	**Offshore:** Although Alternative G would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	
				Onshore: Same as offshore impacts.	**Onshore:** Same as offshore impacts.
Noise	Noise impacts are expected from OSW and non-OSW construction and vessel traffic but are not expected to result in radar interference.	No future activities were identified within the GAA other than ongoing activities.	The effects of this IPF from the No Action Alternative would not impact land-based radar because noise from future OSW activities would not affect radar systems. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore:** Airborne noise from construction of the Proposed Action would have a **negligible** adverse effect on land-based radar systems because noise from future OSW activities would not affect radar systems. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	**Offshore:** Although Alternative G would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
				Onshore: Same as offshore impacts.	**Onshore:** Same as offshore impacts.
Port utilization	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. Impacts from these activities would be short term but could result in increased radar interference.	No future activities were identified within the GAA other than ongoing activities.	There could be an increase in vessel use at ports associated with the No Action Alternative. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Port utilization is also not expected to increase beyond what is currently allowed under land use regulations; therefore, there would be **negligible** adverse impacts from increased port utilization on land-based radar.	**Offshore:** Various ports would be improved to support the Proposed Action (see Section 3.14). These improvements would occur within the boundaries of existing port facilities, would be similar to existing activities at the existing ports, and would support state strategic plans and local land use goals for the development of waterfront infrastructure. The number of construction vessels associated with the Proposed Action would increase, which could result in vessel congestion at ports, but this would be a short-term effect. An increase in vessel traffic could result in increased radar interference. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Because port utilization is not expected to increase beyond what is currently allowed under land use regulations, port utilization is expected to have a **negligible** adverse effect on land-based radar. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	**Offshore:** Although Alternative G would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
				Onshore: Same as offshore impacts.	**Onshore:** Same as offshore impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Presence of structures: Navigation hazards	Constructed and permitted OSW COP projects are introducing 81 structures into the GAA. Wind developments in the direct line-of-sight with, or extremely close to, radar systems can cause clutter and interference.	Reasonably foreseeable non-OSW structures proposed for construction in the lease areas that could affect radar systems have not been identified.	See Section 3.17.2.3.2 for analysis.	See Section 3.17.2.1, Table 3.17-1 and Section 3.17.2.8 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Traffic: Aviation	Military air traffic use the area, and government and other private aircraft could occasionally fly over the WEA for data collection and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments.	Although no future non-OSW stationary structures were identified within the offshore GAA, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non-OSW is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.	Future OSW activities without the Proposed Action could result in increased air traffic due to the use of helicopters and other aircraft during construction, installation, O&M, and decommissioning of future wind projects. While the exact increase in future project-related flights is unknown, it is anticipated that future OSW activities would result in a small increase in flight traffic. Future OSW projects would be required to engage the FAA in flight planning to avoid impacts to civilian, commercial, government, and military aviation operations. With implementation of FAA-approved flight plans, impacts of the No Action Alternative on land-based radar would be **negligible** adverse.	**Offshore:** The Proposed Action would result in an increase in air traffic related to construction and installation of offshore Project elements. Two helicopter trips per day are anticipated per day during construction, with a total flight time of 8,832 hours, or approximately 4,416 hours per year over the 2-year construction period. Extrapolating from nationwide statistics cited in Section 3.17.2.2.1, helicopter flights for Project construction would represent a 63% increase in annual helicopter flight hours and a 7% increase in general aviation flight hours in the GAA during Project construction. O&M of the Proposed Action would result in a 0.01% increase in general aviation in the GAA. A helicopter route plan would be developed to meet industry guidelines and best practices in accordance with FAA guidance. The addition of one to two helicopter trips per day would have a **negligible** adverse impact on land-based radar in the GAA. The Proposed Action would result in an average 1% increase in general aviation in the GAA over a 32-year construction, installation, O&M, and decommissioning period, with reasonably foreseeable future actions anticipated to have similar impacts in scale and duration. On the basis of a 1% increase in general aviation in the GAA, the cumulative effects of this IPF on land based radar would be **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	**Offshore:** Although Alternative G would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
				Onshore: Same as offshore impacts.	**Onshore:** Same as offshore impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Traffic: Vessels	Current vessel traffic in the region is described in Section 3.16.1. The GAA would continue to have numerous ports and extensive marine traffic related to constructed and permitted OSW COP projects, shipping, fishing, and recreation. WTG spacing that allows more space for vessels to navigate would reduce potential interference on radar systems.	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 30 years. Even with increased port visits by deep draft vessels and consistent generation of new vessel traffic by proposed barge routes and dredging demolition sites, this is still a relatively small adjustment when considering the whole of New England vessel traffic	See Section 3.17.2.3.2 for analysis.	See Section 3.17.2.1, Table 3.17-1 and Section 3.17.2.8 for analysis of impacts.	See Sections 3.17.2.1, Table 3.17-1 for analysis of impacts.
Climate change	Climate change has resulted in a measurable increase in annual precipitation on the East Coast.	Sea level rise and storm severity/frequency would increase due to the effects of climate change.	Future OSW activities could result in construction activities that increase GHG emissions. Increased GHG emissions could contribute to climate change impacts. Climate change has resulted in a measurable increase in annual precipitation on the East Coast. However, the construction of future OSW facilities would ultimately help slow the negative effects of climate change by redistributing some of the East Coast's energy generation to renewable sources. On this basis, the effects of climate change on land-based radar under the No Action Alternative would be **negligible** adverse.	**Offshore:** The Proposed Action could result in construction, O&M and decommissioning activities that increase GHG emissions. Increased GHG emissions could contribute to climate change impacts. However, the beneficial impacts to climate change would be increased due shifting energy sources from nonrenewable to renewable sources, which would help offset additional future additional negative effects of climate change. Climate change impacts from the Proposed Action would not impact land-based radar because the construction, operation, and maintenance of land-based radar systems is not affected by climate change that can be linked to the Proposed Action. Therefore, the effects of climate change on land-based radar under the Proposed Action would be **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse. **Onshore:** Same as offshore impacts.	**Offshore:** Although Alternatives G would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse. **Onshore:** Same as offshore impacts.

* Includes three constructed and permitted COP projects within the land-based radar GAA: Block Island, SFWF, and Vineyard Wind 1.

Other Marine Uses: Scientific Research and Surveys

Table E2-19. **Summary of Activities and the Associated Impact-Producing Factors for Other Marine Uses: Scientific Research and Surveys**

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases and discharges	Accidental releases and discharges of fuels and fluids have the potential to occur during vessel usage for permitted and built OSW COP projects, dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable line and pipeline laying activities.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities.	Fuels and oils would be required for construction and installation, O&M, and decommissioning of future OSW activities. In the event of a spill or release during construction and installation activities, offshore water quality would be degraded. OSRPs would be required for all future OSW projects, which includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. Releases during construction of future OSW activities during all phases of project construction would generally be localized and short term, resulting in little change to water quality. In the event of a spill, water quality could be temporarily impacted, which could alter water quality in the vicinity of the spill. This could alter results of scientific surveys that are water quality dependent. However, an OSRP has been prepared for the Project and includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. Therefore, the effects of accidental releases and discharges on scientific research and surveys from future OSW activities without the Proposed Action would be **negligible** adverse.	**Offshore:** Fuels and oils would be required for Proposed Action offshore construction and installation, O&M, and decommissioning equipment, vessels, and infrastructure. In the event of a spill or release, offshore water quality would be degraded. As described in Section 3.21.1.2, the likelihood of a spill due to construction and installation activities and weather events is low (once per 1,000 years). However, water quality could be temporarily impacted in the vicinity of the spill. This could alter results of scientific surveys that are water quality dependent. An OSRP has been prepared for the Project and includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. Therefore, the effects of accidental releases and discharges on scientific research and surveys from the Proposed Action would be **negligible** adverse. Reasonably foreseeable activities could also result in accidental releases and discharges, although those projects would be subject to the same minimization measures as the RWF. Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse. **Onshore:** The construction and installation of onshore Project components would not impact scientific research and surveys because accidental releases and discharges would be limited to an onshore construction footprint and scientific research and surveys	**Offshore:** Although Alternative G would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse. **Onshore:** The construction and installation of onshore Project components would not impact scientific research and surveys because accidental releases and discharges would be limited to an onshore construction footprint and scientific research and surveys would occur offshore. This IPF would result in a **negligible** adverse impact.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				would occur offshore. This IPF would result in a **negligible** adverse impact.	
Anchoring and new cable emplacement/maintenance	Impacts from this IPF have the potential to occur due to permitted and built OSW COP projects, ongoing military use and survey, commercial, and recreational activities. These activities potentially increase navigational complexity and vessel traffic but are expected to minimally impact scientific research and surveys.	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Cable emplacement/maintenance would be infrequent and short term.	See Section 3.17.2.5.2 for analysis.	See Section 3.17.2.1, Table 3.17-1 and Section 3.17.2.10 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Light	Constructed and permitted OSW COP projects are introducing 83 lighted structures into the GAA, as well as lighted vessels. Other impacts from lighting on scientific research and surveys include light associated with non-OSW military, commercial, or construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis. These lighting sources could change species' behavior, which could impact the results of scientific research and surveys.	Future activities with the potential to result in lighting impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities. Light pollution from vessel traffic would continue at the current intensity along the Northeast coast, with a slight increase due to population increase and development over time. Light from onshore structures is expected to gradually increase in line with human population growth along the coast, with minimal offshore impacts.	See Section 3.17.2.5.2 for analysis.	See Section 3.17.2.1, Table 3.17-1 and Section 3.17.2.10 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Noise	Noise impacts are expected from OSW and non-OSW construction and vessel traffic. Construction occurs frequently in nearshores 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 local and temporary. Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this IPF consist of constructed and permitted OSW COP projects, commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the GAA for this resource. Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.	Construction and installation of future OSW projects would result in temporary increases in construction and decommissioning noise. There would be low levels of operational noise as part of future OSW projects. Construction noise has the potential to interfere with scientific research and surveys if such surveys are sensitive to noise impacts. However, construction noise levels are expected to be below regulatory thresholds and would be short term in duration. Operational noise impacts are expected to be very minimal and would also be below regulatory thresholds. Therefore, noise would have a **negligible** adverse impact on scientific research and surveys.	**Offshore and Onshore:** Construction and installation of the Proposed Action would result in a temporary increase in construction noise. O&M and decommissioning of the Proposed Action would result in long-term, permanent low levels of operational noise and temporary noise during decommissioning. These noise sources have the potential to interfere with scientific research and surveys if such surveys are sensitive to noise impacts. However, because NMFS anticipates that construction and O&M of the Project would result in curtailment of scientific research and surveys in the GAA, noise would have a **negligible** adverse impact on scientific research and surveys. Reasonably foreseeable activities would also increase noise in the area, which could interfere with scientific research and surveys. However, reasonably foreseeable future actions would also result in curtailment of scientific research and surveys in the RI/MA	**Offshore and Onshore:** Although Alternative G would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				WEA as additional wind projects are constructed. Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	
Port utilization	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in port usage. The increased activity could increase navigational complexity and vessel traffic, which could impede scientific research and studies.	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 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.	Various ports would be improved to support future OSW development within the GAA (see Section 3.14). These improvements would occur within the boundaries of existing port facilities, would be similar to existing activities at the existing ports, and would support state strategic plans and local land use goals for the development of waterfront infrastructure. The number of construction vessels would increase due to future OSW activities without the Proposed Action, which could result in delays and congestion at ports that could lead to potential conflicts with scientific research vessels due to increased port activity. Navigational hazards and collision risks at ports and in transit routes would be reduced as construction is completed, and all navigation hazards and collision risks would be gradually eliminated during decommissioning as offshore WTGs are removed. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Therefore, port utilization is expected to have a **negligible** adverse effect on scientific research and surveys.	**Offshore and Onshore:** Various ports would be improved to support the Proposed Action (see Section 3.14). These improvements would occur within the boundaries of existing port facilities, would be similar to existing activities at the existing ports, and would support state strategic plans and local land use goals for the development of waterfront infrastructure. Because port utilization is not expected to increase beyond what is currently allowed under land use regulations, port utilization that supports the Proposed Action would not impact scientific research and surveys. The number of construction and operational vessels would increase due to the Proposed Action, which could result in delays and congestion at ports that could lead to conflicts with scientific and research vessels. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Therefore, port utilization is expected to have a **negligible** adverse effect on scientific research and surveys. Reasonably foreseeable future actions would also result in improvements at various ports to support future OSW projects (see EIS Appendix E). These improvements would occur within the boundaries of existing port facilities, would be similar to existing activities at the existing ports, and would also support state strategic plans and local land use goals for the development of waterfront infrastructure. Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and	**Offshore and Onshore:** Although Alternative G would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				reasonably foreseeable activities would be **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	
Presence of structures: Navigation hazards	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. NOAA has concluded that, within OSW facility areas, survey operations would be curtailed, if not eliminated, under current vessel capacities and monitoring protocols. Specifically, coordinators of large vessel survey operations or operations deploying mobile survey gear have currently determined that activities within OSW facilities are not within their safety and operational limits.	Reasonably foreseeable non-OSW 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.	See Section 3.17.2.5.2 for analysis.	See Section 3.17.2.1, Table 3.17-1 and Section 3.17.2.10 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.
Traffic: Aviation	Military air traffic use the area and government and other private aircraft could occasionally fly over the WEA for data collection and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments. Some vessels or low-flying aircraft may be required to alter course to avoid WTGs associated with constructed and permitted OSW COP projects. NOAA policy advises survey vessels to remain at least 1 mile from fixed structures if possible.	Although no future non-OSW stationary structures were identified within the offshore GAA, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non-OSW is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.	Future OSW activities without the Proposed Action could result in increased air traffic due to the use of helicopters and other aircraft during construction and installation, O&M, and decommissioning of future wind projects. While the exact increase in future project-related flights is unknown, it is anticipated that future OSW activities would result in a small increase in flight traffic. Future OSW projects would be required to engage the FAA in flight planning to avoid impacts to civilian, commercial, government, and military aviation operations. With implementation of FAA-approved flight plans, impacts of the No Action Alternative on scientific research and surveys would be **negligible** adverse.	**Offshore and Onshore:** Construction and installation of the Proposed Action would result in a 7% increase in general aviation in the GAA. O&M of the Proposed Action would result in a 0.01% increase in general aviation in the GAA. Please refer to Section 3.17 for analysis of the Project's construction and installation impacts. On the basis of the estimated increase in general aviation in the GAA, the effects of this IPF on scientific research and surveys under the Proposed Action would be **negligible** adverse, as the 7% increase in general aviation flight hours is not anticipated to impact air-based scientific research and surveys. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	**Offshore and Onshore:** Although Alternative G would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
Traffic: Vessels	Current vessel traffic in the region is described in Section 3.16.1. The GAA would continue to have numerous ports and extensive marine traffic related to constructed and permitted OSW COP projects, shipping, fishing, and recreation.	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 30 years. Even with increased port visits by deep draft vessels and	See Section 3.17.2.5.2 for analysis.	See Section 3.17.2.1, Table 3.17-1 and Section 3.17.2.10 for analysis of impacts.	See Section 3.17.2.1, Table 3.17-1 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	These sources of vessel traffic may lead to course changes of scientific and research vessels or increase risk of collision.	consistent generation of new vessel traffic by proposed barge routes and dredging demolition sites, this is still a relatively small adjustment when considering the whole of New England vessel traffic.			
Climate change	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters and sea level rise.	No future activities were identified within the GAA other than ongoing activities.	The ongoing effects of global climate change are expected to adversely affect many marine resources that are the subject ongoing survey and research efforts. Climate change could influence the planning and objectives of future scientific research and surveys but would not be expected to have a measurable effect on their implementation. Therefore, the effects of this IPF on scientific surveys and research would be **negligible** adverse.	**Offshore and Onshore:** The ongoing effects of global climate change are expected to adversely affect many marine resources that are the subject of ongoing survey and research efforts. Climate change could influence the planning and objectives of future scientific research and surveys but would not be expected to have a measurable effect on their implementation. Therefore, the effects of this IPF on scientific surveys and research would be **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	**Offshore and Onshore:** Although Alternative G would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.

* Includes all constructed and permitted COP projects within the scientific survey GAA: Block Island, SFWF, Vineyard Wind 1, and Coastal Virginia Offshore Wind.

Other Marine Uses: Offshore Energy Uses

Affected environment: The OCS near the Project is currently experiencing active leasing and exploration in support of OSW energy development. EIS Appendix E provides a list of known and anticipated OSW project and wind energy leases existing in the area that could lead to additional wind farm development. BOEM anticipates that developers could continue to propose OSW energy projects near the Project. The trend in increased wind farm development is anticipated to continue on the OCS. Several tidal energy projects have been implemented in the region and several are in the planning stages (see Appendix E of the COP). Tidal energy projects are typically located in the nearshore environment where landforms constrict tidal water passage, thereby increasing the velocity of tidal currents. These landforms exist in Narragansett Bay within the GAA; however, more detailed studies are needed to assess sites and determine economic viability for tidal energy uses (Robichaud et al. 2012). The Town of Edgartown has pursued developing a tidal energy site in the Muskeget Channel between Martha's Vineyard and Nantucket Island since 2007. It has operated as a test site and is usable for a wide range of testing. To date, over $2 million has been expended on resource, benthic, sediment, marine mammal, and other studies. The Bourne Tidal Test Site is located on Cape Cod Canal has been used for small tidal energy demonstration projects (New England Marine Energy Development System 2017).

Table E2-20. Summary of Activities and the Associated Impact-Producing Factors for Other Marine Uses: Offshore Energy Uses

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases and discharges	Accidental releases and discharges of fuels and fluids have the potential to occur during vessel usage for permitted and built OSW COP projects, dredge material ocean disposal, fisheries use, marine transportation, military use, survey	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue a similar trend to ongoing activities.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of OSW is already evaluated as part of all other IPFs and uses.	**Offshore:** Because offshore energy projects occur within individual lease areas, there would be no opportunity for the RWF to directly overlap or substantially interfere with other renewable energy projects. Therefore, accidental releases and discharge associated with the RWF would not impact other offshore	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	activities, and submarine cable line and pipeline laying activities.		The reader is referred to other subsections for evaluation of the impacts of future OSW on marine uses.	energy projects; This IPF would result in a **negligible** adverse impact for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	
Anchoring and new cable emplacement/ maintenance	Impacts from this IPF have the potential to occur due to permitted and built OSW COP projects, ongoing military use and survey, commercial, and recreational activities. These activities could cause potential conflicts with other offshore energy uses.	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Cable emplacement/maintenance would be infrequent and short term.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of OSW is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future OSW on marine uses.	**Offshore:** Because offshore energy projects occur within individual lease areas, there would be no opportunity for the RWF to directly overlap or substantially interfere with other renewable energy projects. Therefore, anchoring and new cable emplacement/maintenance associated with the RWF would not impact other offshore energy projects; This IPF would result in a **negligible** adverse impact for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.
Light	Constructed and permitted OSW COP projects are introducing 83 lighted structures into the GAA, as well as lighted vessels. Other impacts from lighting on offshore energy uses include light associated with non-OSW military, commercial, or construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis. Impacts are expected to be minimal.	Future activities with the potential to result in lighting impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities. Light pollution from vessel traffic would continue at the current intensity along the Northeast coast, with a slight increase due to population increase and development over time. Light from onshore structures is expected to gradually increase in line with human population growth along the coast, with minimal offshore impacts.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for standalone cumulative analysis because the impact of OSW is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future OSW on marine uses.	**Offshore:** Because offshore energy projects occur within individual lease areas, there would be no opportunity for the RWF to directly overlap or substantially interfere with other renewable energy projects. Therefore, light impacts associated with the RWF would not impact other offshore energy projects; This IPF would result in a **negligible** adverse impact for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.
Noise	Noise impacts are expected from OSW and non-OSW construction and vessel traffic. Construction occurs frequently in nearshores 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 local and	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the GAA for this resource. Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of OSW is already evaluated as part of all other IPFs and uses.	**Offshore:** Because offshore energy projects occur within individual lease areas, there would be no opportunity for the RWF to directly overlap or substantially interfere with other renewable energy projects. Therefore, noise associated with the RWF would not impact other offshore energy projects; This IPF would result in a **negligible** adverse impact for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	temporary. Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this IPF consist of constructed and permitted OSW COP projects, commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.		The reader is referred to other subsections for evaluation of the impacts of future OSW on marine uses.	Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	
Port utilization	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in navigation patterns at nearby airports. The increased activity could cause potential conflicts with other offshore energy uses.	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 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, changes in port usage by some fishing or recreational vessel operators, and changes in navigation patterns.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of OSW is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future OSW on marine uses.	**Offshore:** If construction time frames with other OSW energy project overlap, there could be increased impacts to construction ports. Such impacts are not anticipated to affect construction timelines or alter the layouts of other renewable energy projects. For this reason, impacts are deemed **negligible** adverse for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.
Presence of structures: Navigation hazards	Constructed and permitted OSW COP projects are introducing 83 structures into the GAA. Other stationary structures are limited in the open ocean environment of the GAA and include met buoys associated with site assessment activities. Navigation complexity associated with existing structures could cause potential conflicts with other offshore energy uses.	Reasonably foreseeable non-OSW 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.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of OSW is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future OSW on marine uses.	**Offshore:** Because offshore energy projects occur within individual lease areas, there would be no opportunity for the RWF to directly overlap or substantially interfere with other renewable energy projects. Therefore, this IPF would result in a **negligible** adverse impact for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.
Traffic: Aviation	Military air traffic use the area, and government and other private aircraft could occasionally fly over the WEA for data collection and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments.	Although no future non-OSW stationary structures were identified within the offshore GAA, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non-OSW is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of OSW is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future OSW on marine uses.	**Offshore:** Construction and installation of the Proposed Action would result in a 7% increase in general aviation in the GAA. O&M of the Proposed Action would result in a 0.01% increase in general aviation in the GAA. On the basis of the estimated increase in general aviation in the GAA, the effects of this IPF on offshore energy uses under the Proposed Action would be **negligible** adverse for the Proposed Action. Although Alternatives C through F would require fewer construction vessel and helicopter trips and WTGs and would reduce the overall duration of construction	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
				activities relative to the Proposed Action, impacts would also be **negligible** adverse.	
Traffic: Vessels	Current vessel traffic in the region is described in Section 3.16.1. The GAA would continue to have numerous ports and extensive marine traffic related to constructed and permitted OSW COP projects, shipping, fishing, and recreation. These sources of vessel traffic may increase navigation, which could cause potential conflicts with other offshore energy uses.	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 30 years. Even with increased port visits by deep draft vessels and consistent generation of new vessel traffic by proposed barge routes and dredging demolition sites, this is still a relatively small adjustment when considering the whole of New England vessel traffic	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of OSW is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future OSW on marine uses.	**Offshore:** If construction or O&M time frames with other OSW energy project overlap, there could be increased navigation risk due to an increase in vessels in the GAA. Such impacts are not anticipated to affect construction timelines or alter the layouts of other renewable energy projects. For this reason, adverse impacts to other renewable energy projects are deemed **negligible** adverse for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.
Climate change	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters and sea level rise.	No future activities were identified within the GAA other than ongoing activities.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of OSW is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future OSW on marine uses.	**Offshore:** Climate change impacts from the Proposed Action would not have a measurable effect on other offshore energy uses. This IPF would result in a **negligible** adverse impact for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	**Offshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.

* Includes all constructed and permitted COP projects that occur within the offshore energy uses GAA: Block Island, SFWF, Vineyard Wind 1, and Coastal Virginia Offshore Wind.

Other Marine Uses: Marine Mineral Resources and Dredged Material Disposal

Affected environment: BOEM's Marine Minerals Program manages non-energy minerals (primarily sand and gravel) in federal waters of the OCS and leases access to these resources to target shoreline erosion, beach renourishment, and restoration projects. At this time, there are no active or requested BOEM leases near the Project. The closest active BOEM lease is offshore of New Jersey, approximately 162 miles from the Project (BOEM 2018). One USACE borrow area (7A) is located offshore the town of Wainscott, in the vicinity of the RWEC.

The EPA designates and manages dredged material disposal sites, and the USACE permits the disposal of material in the sites. One active disposal site, the Rhode Island Sound Disposal Site, is located in the GAA approximately 3 miles east of Block Island, Rhode Island, and 10 miles west of the western boundary of the proposed RWF. No inactive or closed disposal sites are located in the GAA.

Increased shoreline erosion and coastal damage from storms has led to increased demand for sand resources in recent years.

Table E2-21. **Summary of Activities and the Associated Impact-Producing Factors for Other Marine Uses: Marine Mineral Resources and Dredged Material Disposal**

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
Accidental releases and discharges	Accidental releases and discharges of fuels and fluids have the potential to occur during vessel usage for permitted and built OSW COP projects, dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable line and pipeline laying activities.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities.	Fuels and oils would be required for construction, installation, O&M, and decommissioning of future OSW projects. In the event of a spill or release during construction and installation activities, offshore water quality would be degraded. OSRPs would be required for all future OSW projects, which includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. Releases during construction of future OSW projects during all phases of project construction would generally be localized and short term, resulting in little change to water quality. In the event of a spill, marine mineral resources could potentially be impacted if such resources are susceptible to harm from contaminants, although the impacts would be very minimal. Therefore, the effects of vessel traffic on marine mineral resources and dredged material disposal under the No Action Alternative would be **negligible** adverse.	**Offshore and Onshore:** Fuels and oils would be required for Proposed Action offshore construction and installation, O&M, and decommissioning equipment, vessels, and infrastructure. In the event of a spill or release during construction and installation activities, offshore water quality would be degraded. As described in Section 3.21.1.2, the likelihood of a spill due to construction and installation activities and weather events is low (once per 1,000 years). An OSRP has been prepared for the Project and includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. A release during construction and installation of the Proposed Action would generally be localized and short term, resulting in little change to water quality. In the event of a spill, marine mineral resources could potentially be impacted if such resources are susceptible to harm from contaminants, although the impacts would be very minimal. Therefore, the effects of accidental releases and discharges on marine mineral resources and dredged material disposal under the Proposed Action would be **negligible** adverse. Reasonably foreseeable activities could also result in accidental releases and discharges, although those projects would be subject to the same minimization measures as the RWF. Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be **negligible** adverse. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint and duration of construction activities, but effects would also be **negligible** adverse.	**Offshore and Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.
New cable emplacement/maintenance	Impacts from this IPF have the potential to occur due to permitted and built OSW COP projects, military use and survey, and commercial and recreational activities. These disturbances would be local and limited to emplacement corridors.	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Cable emplacement/maintenance would be infrequent and short term.	Future offshore cable installation could prevent future marine mineral extraction activities where project footprints overlap with extraction areas (typically within 8 miles of the shoreline). Therefore, only a portion of new OSW cables could potentially overlap extraction areas. Additionally, future projects would avoid identified borrow areas by	**Offshore and Onshore:** Because marine mineral resources and EPA dredged material disposal sites are located outside the GAA, Project anchoring and new cable emplacement/maintenance would result in a **negligible** adverse impact for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and	**Offshore and Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
			consulting with the BOEM Marine Minerals Program and the USACE before approving OSW cable routes. Therefore, the effects of anchoring and new cable emplacement/maintenance under the No Action Alternative would be **negligible** adverse.	WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.	
Light	Constructed and permitted OSW COP projects are introducing 13 lighted structures into the GAA, as well as lighted vessels. Impacts from lighting on offshore energy uses also include light associated with military, commercial, or construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis. Impacts are expected to be minimal.	Future activities with the potential to result in lighting impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities. Light pollution from vessel traffic would continue at the current intensity along the Northeast coast, with a slight increase due to population increase and development over time. Light from onshore structures is expected to gradually increase in line with human population growth along the coast, with minimal offshore impacts.	The effects of this IPF from the No Action Alternative would not impact marine mineral resources and dredged material disposal because light from future OSW activities would not affect marine mineral resources and dredged material disposal sites or activities. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore and Onshore:** The effects of this IPF from the Proposed Action to marine mineral resources and dredged material disposal would be **negligible** adverse because marine mineral resources and EPA dredged material disposal sites are located outside the GAA. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint, duration of construction activities, but effects would also be **negligible** adverse.	**Offshore and Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.
Noise	Noise impacts are expected from OSW and non-OSW construction and vessel traffic. Construction occurs frequently in nearshores 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 local and temporary. Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this IPF consist of constructed and permitted OSW COP projects, commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the GAA for this resource. Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.	The effects of this IPF from the No Action Alternative would not impact marine mineral resources and dredged material disposal because noise from future OSW activities would not affect marine mineral resources and dredged material disposal. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore and Onshore:** The effects of this IPF from the Proposed Action to marine mineral resources and dredged material disposal would be **negligible** adverse because marine mineral resources and EPA dredged material disposal sites are located outside the GAA. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint, duration of construction activities, but effects would also be **negligible** adverse.	**Offshore and Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.
Port utilization	Constructed and permitted OSW COP projects are using nearby ports to support construction and O&M activities. The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance.	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 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, changes in	The effects of this IPF from the No Action Alternative would be **negligible** adverse on marine mineral resources and dredged material disposal because port utilization and potential increased vessel traffic resulting from the No Action Alternative are not	**Offshore and Onshore:** Various ports would be improved to support the Proposed Action (see Section 3.14). The number of construction and maintenance vessels associated with the Proposed Action would increase which could result in vessel congestion at ports and potential collision risk with marine mineral	**Offshore and Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	Impacts from these activities would be short term and could include congestion in ports, delays, and changes in navigation patterns.	port usage by some fishing or recreational vessel operators, and changes in navigation patterns.	expected to overlap with BOEM lease areas or EPA dredged material disposal sites.	resource or dredging vessels leaving or returning to ports, but this would be a minimal increase in vessel traffic. Also, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Therefore, port utilization is expected to have a **negligible** adverse effect on marine mineral resources and dredged material disposal. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint and duration of construction activities, but effects would also be **negligible** adverse.	
Presence of structures: Navigation hazards	Constructed and permitted OSW COP projects are introducing 13 structures into the GAA. Other existing stationary structures are limited in the open ocean environment of the GAA, and include met buoys associated with site assessment activities. Navigation complexity associated with existing structures could cause potential conflicts with other marine activities.	Reasonably foreseeable non-OSW 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.	Future offshore WTGs and OSSs could prevent future marine mineral extraction activities where project footprints overlap with extraction areas. However, this is unlikely as mineral extraction typically occurs within 8 miles of the shoreline. Therefore, there would be no risk of overlap with offshore structures, and their presence would have a **negligible** adverse effect on this resource.	**Offshore and Onshore:** There are no BOEM OCS sand and mineral lease areas and no identified sand resource blocks within the RWF and offshore RWEC; therefore, the Project and other reasonably foreseeable activities would have no impacts from structures or cable placement on these marine mineral resources. Similarly, because Project activities would not overlap any active dredged material disposal sites, the Project would have a **negligible** adverse impact on dredged material disposal. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint, duration of construction activities, but effects would also be **negligible** adverse.	**Offshore and Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.
Traffic: Aviation	Military air traffic use the area, and government and other private aircraft could occasionally fly over the WEA for data collection and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments.	Although no future non-OSW stationary structures were identified within the offshore GAA, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non-OSW is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.	The effects of this IPF from the No Action Alternative would not impact marine mineral resources and dredged material disposal because aviation and air traffic are air- and land-based impacts that do not overlap with marine mineral resources and dredged material disposal uses. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore and Onshore:** The effects of this IPF from the Proposed Action would not impact marine mineral resources and dredged material disposal because aviation and air traffic are air- and land-based impacts that would not impact underwater marine mineral resources and dredged material disposal. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint, duration of construction activities, but effects would also be **negligible** adverse.	**Offshore and Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.
Traffic: Vessels	Current vessel traffic in the region is described in Section 3.16.1. The GAA would continue to have numerous ports	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not	Construction and operational vessel traffic from future OSW development is expected to increase. This could create conflicts with	**Offshore and Onshore:** Construction and operational vessel traffic from the Proposed Action is expected to occur. This could create	**Offshore and Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF

Associated IPFs: Sub-IPFs	Ongoing Activities*	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Proposed Action and Alternatives C through F	Alternative G (Preferred Alternative)
	and extensive marine traffic related to constructed and permitted OSW COP projects, shipping, fishing, and recreation. These sources of vessel traffic may increase navigation, which could cause potential conflicts with other marine activities.	anticipate vessel traffic to greatly increase over the next 30 years. Even with increased port visits by deep draft vessels and consistent generation of new vessel traffic by proposed barge routes and dredging demolition sites, this is still a relatively small adjustment when considering the whole of New England vessel traffic	vessels undergoing marine mineral extraction and dredged disposal activities. However, because future OSW activities would take place within the RI/MA WEA and there is no marine mineral extraction or dredged material disposal areas that overlap, this impact is expected to be **negligible** adverse.	conflicts with vessels undergoing marine mineral extraction and dredged disposal activities. However, because the Proposed Action would take place within the RI-MA WEA and there is no marine mineral extraction or dredged material disposal areas that overlap, this impact is expected to be **negligible** adverse. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint and duration of construction activities, but effects would also be **negligible** adverse.	would result in a **negligible** adverse impact.
Climate change	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters and sea level rise.	No future activities were identified within the GAA other than ongoing activities.	Future OSW activities without the Proposed Action could result in construction activities that increase GHG emissions. Increased GHG emissions could contribute to climate change impacts. However, the construction of future OSW facilities would ultimately help slow the negative effects of climate change by redistributing some of the East Coast's energy generation to renewable sources. While negative impacts of climate change could affect marine mineral resources due to ocean acidification and other negative effects of climate change, future OSW activities without the Proposed Action are expected to help slow the negative impacts of climate change overall. Therefore, the effects of climate change under the No Action Alternative would be **negligible** adverse.	**Offshore and Onshore:** The Proposed Action could result in offshore and onshore construction, O&M, and decommissioning activities that increase GHG emissions. Increased GHG emissions could contribute to climate change impacts. However, O&M would help slow the negative effects of climate change by redistributing some of the East Coast's energy generation to renewable sources and reducing net GHG emissions in the area. While negative impacts of climate change could affect marine mineral resources due to ocean acidification and other negative effects of climate change, the Proposed Action is expected to help slow the negative impacts of climate change overall. Therefore, the effects of climate change under the Proposed Action by itself combined with other reasonably foreseeable projects would be **negligible** adverse. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint and duration of construction activities, but effects would also be **negligible** adverse.	**Offshore and Onshore:** Similar impacts to the Proposed Action and Alternatives C through F. This IPF would result in a **negligible** adverse impact.

* Includes one constructed and permitted COP project that occurs within the marine mineral GAA: SFWF.

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APPENDIX E2

Assessment of Resources with Minor (or Less) Impact Determinations

Contents

Figures

Tables

Assessment of Resources with Minor Impact Determinations

This appendix provides an assessment of resources with minor or lower incremental impacts from implementation of the Proposed Action and other considered action alternatives. Because these sections were originally part of Chapter 3 of the Revolution Wind Farm and Revolution Wind Export Cable Project environmental impact statement (EIS), chapter and section naming and numbering were maintained for simplicity. All abbreviations and references for these sections are provided in the main EIS and Appendix B, respectively.

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3.4 Air Quality

3.4.1 Description of the Affected Environment for Air Quality

Geographic analysis area: The spatial scale for analysis of potential effects to air quality encompasses 1) the airshed within 25 miles of the estimate Project center (corresponding to the OCS Lease Area) and 2) the airshed within 15.5 miles of onshore construction areas and ports that may be used for the Project. These two areas collectively make up the air quality GAA (Figure 3.4-1) (see COP Figure 4.2.1-1). The air quality GAA encompasses the region subject to U.S. Environmental Protection Agency (EPA) review as part of an OCS permit for the Project under the Clean Air Act (CAA) and provides a reasonable buffer for the limited Project vessel and equipment emissions anticipated to occur within on-land construction areas and mustering port(s) outside of the OCS air permit area during proposed construction activities.

For the purposes of this analysis, the existing air quality conditions for each county within the GAA were evaluated. These counties comprise Providence and Washington Counties in Rhode Island, Suffolk and Kings Counties in New York, New London County in Connecticut, Gloucester County in New Jersey, Bristol and Dukes Counties in Massachusetts, Norfolk City in Virginia, and Baltimore County in Maryland.

Affected environment: The scope of the affected environment for the assessment of potential Project-related emissions and impacts to ambient air quality encompasses offshore areas and those states and counties where Project activities could occur. Project construction and O&M activities could use several regional existing port facilities as discussed in COP Section 3.3.10.1 and COP Table 3.3.10-1.

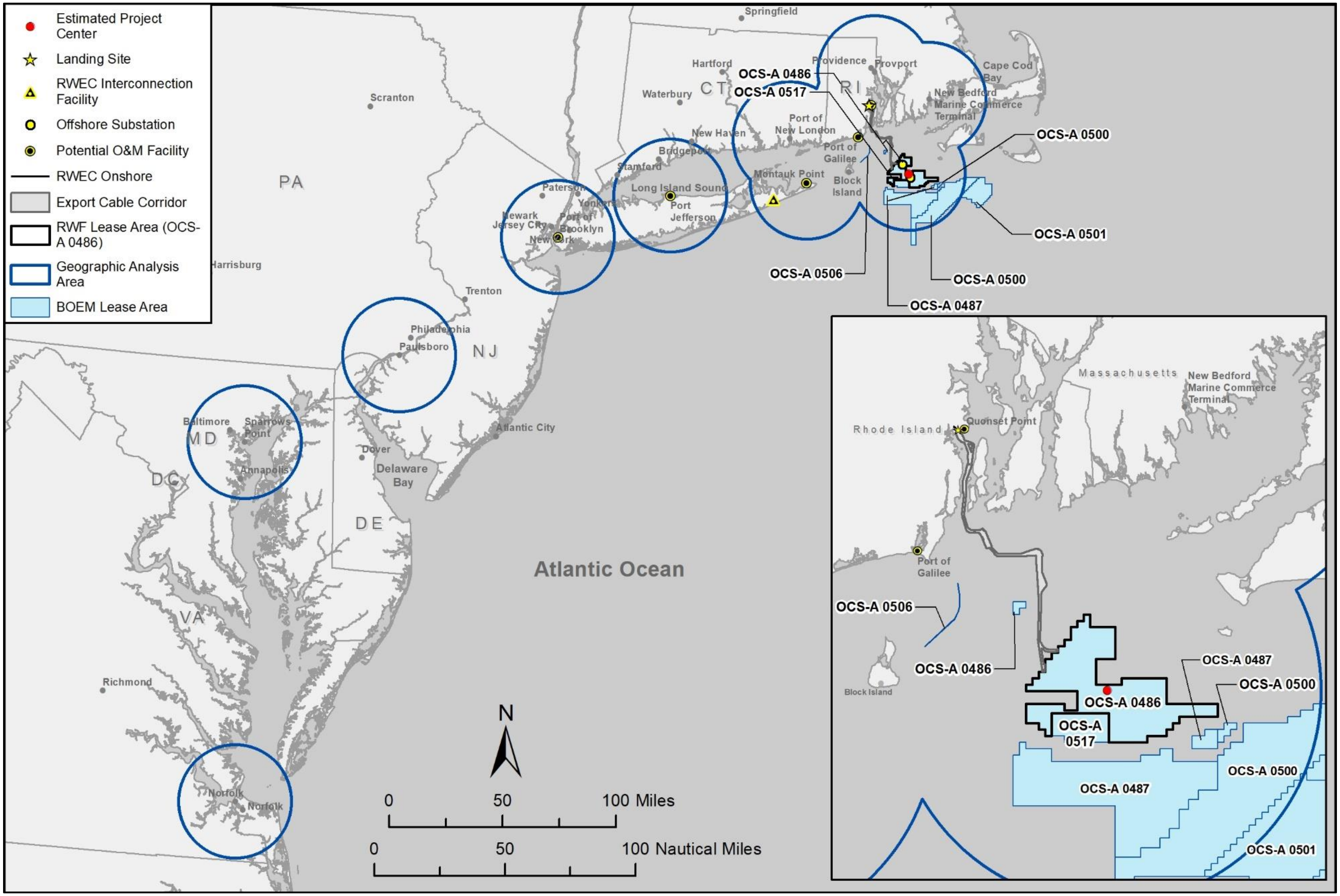

Figure 3.4-1. Geographic analysis area for air quality.

Air quality within a region is measured in comparison to the National Ambient Air Quality Standards (NAAQS), which are standards established by the EPA under the CAA (42 USC 7409) for criteria pollutants. The EPA has developed these standards to protect human health and welfare (primary standards) and provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings (secondary standards). The criteria pollutants for which NAAQS have been established are carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter 10 microns or less (PM_{10}), particulate matter 2.5 microns or less ($PM_{2.5}$), nitrogen dioxide (NO_2), ozone (O_3), and lead. The NAAQS are summarized in Table 3.4-1.

Table 3.4-1. National Ambient Air Quality Standards

Pollutant		Primary or Secondary	Form	Averaging Time	NAAQS
CO		Primary	Not to be exceeded more than once per year	8 hours	9 parts per million (ppm)
				1 hour	35 ppm
Lead		Primary and secondary	Not to be exceeded	Rolling 3-month average	0.15 microgram per cubic meter ($\mu g/m^3$)
NO_2		Primary	Ninety-eighth percentile of 1-hour daily maximum concentrations, averaged over 3 years	1 hour	100 parts per billion (ppb)
		Primary and secondary	Annual mean	1 year	53 ppb
Ozone		Primary and secondary	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years	8 hours	0.070 ppm
PM	$PM_{2.5}$	Primary	Annual mean, averaged over 3 years	1 year	12 $\mu g/m^3$
		Secondary	Annual mean, averaged over 3 years	1 year	15 $\mu g/m^3$
		Primary and secondary	Ninety-eighth percentile, averaged over 3 years	24 hours	35 $\mu g/m^3$
	PM_{10}	PM_{10}	Primary and secondary	Not to be exceeded more than once per year on average over 3 years	150 $\mu g/m^3$
SO_2		Primary	Ninety-ninth percentile of 1-hour daily maximum concentrations, averaged over 3 years	1 hour	75 ppb
		Secondary	Not to be exceeded more than once per year	3 hours	0.5 ppm

Source: EPA (2023).

Note: PM_{10} = PM between 2.5 and 10 micrometers in diameter; $PM_{2.5}$ = PM less than 2.5 micrometers in diameter.

* Preliminary guidance from the EPA looks to reduce the annual $PM_{2.5}$ standard from 12 $\mu g/m^3$ to the range of 9–10 $\mu g/m^3$

The EPA uses design values to designate and classify nonattainment areas. A design value is a statistic that describes pollutant levels at a given location so they can be compared to the NAAQS. Nonattainment occurs if any criteria air pollutant concentration design value exceeds its NAAQS. The CAA amendments of 1990 established the nonattainment designations as marginal, moderate, and serious. If a region is designated as nonattainment for a NAAQS, the CAA requires the state to develop a state implementation plan (SIP). A SIP provides for the implementation, maintenance, and enforcement of the NAAQS, and includes emission limitation and control measures to attain and maintain the NAAQS. The CAA also prohibits federal agencies from approving any activity that does not conform to a SIP, and this prohibition applies only with respect to nonattainment or maintenance areas (i.e., areas that were previously nonattainment and for which a maintenance plan is required). Conformity to a SIP means conformity to a SIP's purpose of reducing the severity and number of violations of the NAAQS to achieve attainment of such standards. The activities for which BOEM has authority are outside of any nonattainment or maintenance area, and BOEM lacks any continuing program responsibility over activities potentially within any nonattainment area. Therefore BOEM's approval of the COP is not subject to the requirement to show conformity.

The areas of attainment for criterial pollutants within the GAA reported by the EPA (2021a) are in Table 3.4-2.

Table 3.4-2. U.S. Environmental Protection Agency Areas of Attainment for Criteria Pollutants

Location	EPA Reporting
Rhode Island, including all counties	Currently in attainment for all criteria pollutants.
Norfolk City, Virginia	Currently in attainment for all criteria pollutants.
Bristol and Norfolk Counties, Massachusetts	Currently in attainment for all criteria pollutants, but Dukes County is currently in marginal nonattainment for the 2008 8-hour O_3 standard.
Suffolk and Kings Counties, New York	Currently in severe nonattainment for the 2008 8-hour O_3 standard, moderate nonattainment for the 2015 8-hour O_3 standard, and in maintenance for the 2006 24-hour $PM_{2.5}$ standard.
Gloucester County, New Jersey	Currently in marginal nonattainment for the 2008 8-hour O_3 standard, moderate nonattainment for the 2015 8-hour O_3 standard, and in maintenance for the 2006 24-hour $PM_{2.5}$ standard.
New London County, Connecticut	Currently in serious nonattainment for the 2008 8-hour O_3 standard and moderate nonattainment for the 2015 8-hour O_3 standard.
Baltimore County, Maryland	Currently in moderate nonattainment for the 2008 8-hour O_3 standard and the 2015 8-hour O_3 standard, and nonattainment for the 2010 SO_2 standard.

Additional descriptions of air quality conditions for counties in nonattainment status are provided below.

Dukes County, Massachusetts, is an island community with a relatively low population density and little heavy industry. As is common in the northeastern region, non-road engines used for construction activities and on-road vehicle traffic are the main sources of nitrogen oxide (NO_X) in Dukes County (EPA 2020a). Vegetation sources and non-road engines are the primary volatile organic compound (VOC) emission sources in Dukes County. VOC and NO_X are precursor pollutants to the formation of O_3.

Although the EPA currently classifies Dukes County as being in marginal nonattainment for the 2008 8-hour O_3 standard, ambient air quality monitors in Dukes County reported a steady decrease in O_3 levels from 2012 to 2015 (EPA 2021b). The EPA also recently (August 2018) designated Dukes County in attainment for the more stringent 2015 8-hour O_3 standard of 70.0 parts per billion (ppb) based on the 2014–2016 O_3 design value of 64.3 ppb (EPA 2021b). Recently, Dukes County reported an O_3 design value of 70.0 ppb for the 2016–2018 time period, 71.0 ppb for the 2017–2019 time period, and 66.0 ppb for the 2018–2020 time period (EPA 2021b).

Suffolk and Kings Counties, New York, have a high population density and Suffolk County sees the highest amount of commuter miles traveled in the New York metro area (EPA 2017). Suffolk County reported a steady decrease in O_3 concentration levels from 2017 to 2020 (EPA 2021b). The O_3 design value based on observations at the Riverhead air monitor in Suffolk County was 76.7 ppb during the 2015–2017 time period, 75.3 ppb for the 2016–2018 time period, 72.0 ppb for the 2017–2019 time period, and 70.0 ppb for the 2018– 2020 time period (EPA 2021b). There is no O_3 air monitor within Kings County. The nearby air monitor in Queens County reported a decrease in O_3 concentration levels from 2018 to 2020. The O_3 design value based on observations at the Queens College air monitor in Queens County was 74.0 during the 2015–2017 time period, 74.0 ppb for the 2016–2018 time period, 74.0 ppb for the 2017–2019 time period, and 70.0 ppb for the 2018–2020 time period (EPA 2021b). Thus, the EPA currently classifies Kings and Suffolk Counties as being in severe nonattainment for 8-hour O_3 according to the 2008 standard and in moderate nonattainment for the 2015 standard. Both counties are also in maintenance for the 2006 24-hour $PM_{2.5}$ standard. The EPA reports that on-road vehicles are the primary source of NO_X emissions emitted within Kings and Suffolk Counties; non-road engines are the second-largest source. Vegetation sources, solvent use in industry, off-highway engines, and on-road vehicles provide the most VOC emissions emitted within Kings and Suffolk Counties (EPA 2020a).

Gloucester County, New Jersey, has a much lower population density than Suffolk and Kings Counties, New York. Air quality within Gloucester County is affected by nearby Philadelphia. NO_X emissions in Gloucester County are primarily from on-road vehicles, with fuel combustion for industrial purposes, electric generation, and other needs being the second-largest source. Storage and transport, vegetation, and solvent use are the primary sources of VOC emissions in Gloucester County (EPA 2020a). Although the EPA currently classifies Gloucester County as being in marginal nonattainment for the 2008 8-hour O_3 standard and moderate nonattainment for the 2015 8-hour O_3 standard, the ambient air quality monitor in Gloucester County reported a steady decrease in O_3 levels from 2018 to 2020 (EPA 2021b). Gloucester County reported an O_3 design value of 74.0 ppb for the 2015–2017 and 2016–2018 time periods, 72.0 ppb for the 2017–2019 time period, and 69.0 ppb for the 2018–2020 time period (EPA 2021b).

New London County, Connecticut, is a rural county with a low population density and small industrial bases. Neighboring metro areas outside this county heavily affect the air quality of the county in addition to regional sources. For this reason, changes to pollutant emissions by sources within the county have little impact on the overall air quality trends. NO_X emissions in New London County are primarily from on-road vehicles, with fuel combustion for industrial purposes, electric generation, and other needs being the second-largest source. Vegetation sources and solvent use are the primary sources of VOC emissions (EPA 2020a). Although the EPA currently classifies the county as being in serious nonattainment for the 2008 8-hour O_3 standard and moderate nonattainment for the 2015 8-hour O_3 standard, the ambient air quality monitor in the county reported a small decrease in O_3 levels from 2018 to 2020 (EPA 2021b). New London County reported an O_3 design value of 76.0 ppb for the 2015–2017 time period, 75.0 ppb for the 2016–2018 and the 2017–2019 time periods, and 73.0 ppb for the 2018–2020 time period (EPA 2021b).

Baltimore County, Maryland, has a population density three times greater than New London County, Connecticut. Although the EPA currently classifies Baltimore County as being in moderate nonattainment for both the 2008 and 2015 8-hour O_3 standards, ambient air quality monitors in Baltimore County reported a steady decrease in O_3 levels from 2018 to 2020 (EPA 2021b). The O_3 design value based on observations at the Essex air monitor in Baltimore County was 73.0 ppb for the 2015–2017 and 2016–2018 time periods, 72.0 ppb for the 2017–2019 time period, and 69.0 ppb for the 2018–2020 time period (EPA 2021b). In Baltimore County, NO_X emissions are primarily from on-road vehicles, with fuel combustion for industrial purposes, electric generation, and other needs being the second-largest source. Vegetation, solvent use, and on-road vehicles are the main sources of VOC emissions (EPA 2020a). The EPA has also classified Baltimore County as being in nonattainment for the 2010 SO_2 standard, although the SO_2 air quality monitor in Baltimore County has reported a steady decline in SO_2 concentration levels since 2016 (EPA 2021b). Baltimore County reported an SO_2 design value of 13.0 ppb for the 2015–2017 time period, 11.0 ppb for the 2016–2018 time period, 10.0 ppb for the 2017–2019 time period, and 9.0 ppb for the 2018–2020 time period (EPA 2021b). The main source of SO_2 emissions in Baltimore County comes from fuel combustion for electric generation (EPA 2020a).

The Ozone Transport Region (OTR) was established by operation of law under CAA Section 184 and comprises the states of Connecticut, Delaware, Maine, Massachusetts, Maryland, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; the District of Columbia; and the portion of Virginia that is within the Consolidated Metropolitan Statistical Areas that includes the District of Columbia. Congress established the OTR in the 1990 CAA amendments based on the recognition that the transport of ozone and ozone precursors throughout the region may render the states' attainment strategies interdependent. States within the OTR may have similar permitting requirements as ozone nonattainment areas.

Table 3.4-3 presents the total emission inventory in tons per year (tpy) for select regulated pollutants (i.e., CO, NO_X, PM_{10}, $PM_{2.5}$, SO_2, and VOC) in nonattainment counties in 2017.

Table 3.4-3. Nonattainment Counties, 2017 Emission Inventory for Regulated Pollutant (tpy)

County, State	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC
New London County, Connecticut	25,671.25	5,300.74	2,882.84	1,072.31	289.57	15,606.98
Dukes County, Massachusetts	6,395.82	989.64	407.96	135.99	13.07	2,740.63
Baltimore County, Maryland	71,702.20	10,661.44	12,184.54	3,207.24	1,041.34	16,919.12
Gloucester County, New Jersey	30,399.73	6,260.63	2,161.41	1,311.48	599.94	10,507.34

County, State	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC
Kings County, New York	59,473.56	13,571.74	4,959.06	2,559.52	477.53	17,660.21
Suffolk County, New York	146,719.86	20,336.81	9,682.55	3,889.70	1,197.73	32,676.35

Source: EPA (2020a).

The CAA provides special air quality protection to national parks larger than 6,000 acres and national wilderness areas larger than 5,000 acres that were in existence before August 1977 (National Park Service 2020). These areas are referred to as Class I areas and are managed by the U.S. Forest Service (USFS), National Park Service (NPS), and U.S. Fish and Wildlife Service (USFWS). Designation as a Class I area allows only very small increments of new pollution above already existing air pollution levels. One of the purposes of the Prevention of Significant Deterioration permitting program under the CAA, is to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value. Air quality related values (AQRVs) are used to determine whether these resources may be adversely affected by a change in air quality. Federal land managers AQRVs include visibility, vegetation, water quality, soils, and impacts to fish and wildlife. The potential harm from air pollution to these resources depends on quantity of emission, the type of air emission exposure, and the sensitivity of the resources. Current visibility conditions and trends in Class I areas are established via the IMPROVE (Interagency Monitoring of Protected Visual Environments) program. The nearest Class I areas to the Proposed Action are Lye Brook Wilderness, located approximately 155 miles northwest of the Lease Area, and Brigantine Wilderness, located approximately 190 miles southwest of the Lease Area. The Lye Brook Wilderness IMPROVE monitor is located on the ski slopes of Mount Snow approximately 9.5 miles southeast of the Lye Brook Wilderness Area boundary. The Brigantine Wilderness is made up of three separate areas; all three are part of the Edwin B. Forsythe National Wildlife Refuge. The Brigantine Wilderness IMPROVE monitor is located at the Edwin B. Forsythe National Wildlife Refuge Visitor Center, approximately 4 miles west and 4 miles south-southwest of the two closest Brigantine Wilderness Area boundaries. Visibility at both the Lye Brook Wilderness and Brigantine Wilderness Class I areas has been steadily improving since 2010 (Federal Land Manager Environmental Database 2021). No visibility or deposition modeling was conducted as part of this EIS analysis because both Lye Brook Wilderness and Brigantine Wilderness Class I areas are located more than 155 miles away from the Lease Area. If further visibility modeling is required, it will be conducted during the OCS permitting process. As part of the EPA's OCS air permit, the Project will be evaluated for compliance with NAAQS and PSD increments for operating emissions and significant impact level, and an AQRV analysis will be conducted at the Lye Brook Wilderness Area for construction emissions.

Climate Change: Climate change is a global issue that results from the increase in greenhouse gases (GHGs) in the atmosphere. An analysis of regional climate impacts prepared by the Fourth National Climate Assessment (U.S. Global Change Research Program 2018) concludes that the rate of warming in the Northeast has markedly accelerated over the past few decades, with seasonal differences in temperature decreasing in recent years as winters have warmed three times faster than summers. Higher temperatures from the increase of GHGs in the atmosphere increase the number of heat events and extreme rain events that cause coastal flooding. The higher temperatures also extend the duration of the pollen season. Analysis of past records and future projections indicates an overall increase in regional temperatures, including near the Lease Area. The most recently available data on GHG emissions in the

United States indicate that annual GHG emissions in 2019 were an estimated 6,558 million metric tons of carbon dioxide equivalents (CO_2e) (EPA 2021c).

Sulfur hexafluoride (SF_6) is often used in electrical switchgears because of its unique properties. However, SF_6 is also the most potent GHG known to date. Fortunately, it is technically feasible to use SF_6-free switchgears for medium voltage switchgear up to 36 kV. Recent independent evaluations show that SF_6-free switchgear is not only technically equivalent, but also more cost competitive over the full service life (Eaton 2021).

The Project would be designed in accordance with the International Electrotechnical Commission 61400-1 and 61400-3 standards. These standards require designs to withstand forces based on site-specific conditions for a 50-year return interval (2% chance occurrence in a single year) for the WTGs, which corresponds to a Category 3 hurricane in this area (International Electrotechnical Commission 2019a). This means that the WTGs are designed not merely for average conditions but for the higher end event that is reasonably likely to occur. The newly revised International Electrotechnical Commission 61400-3 standard now also recommends a robustness load case for extreme metocean conditions, where the WTG support structures are checked for a 500-year event (0.2% chance occurrence in a single year), which corresponds to wind gusts at the strength of a Category 5 hurricane, to ensure that the appropriate level of safety is maintained in case of a less likely event (International Electrotechnical Commission 2019b). The Project would be constructed using a certified verification agent to ensure that all design specifications are met. The Project would also be designed in alignment with the findings of the *NYSERDA: Offshore Wind Climate Adaptation and Resilience Study* (New York State Energy Research and Development Authority [NYSERDA] 2021). It is possible that severe weather could cause blades to fail, but because of the construction design, it is highly unlikely that the towers would topple.

3.4.2 Environmental Consequences

3.4.2.1 Relevant Design Parameters, Impact-Producing Factors, and Potential Variances in Impacts

The Project design parameters that would influence the magnitude of impacts on air quality are listed in Table 3.4-4.

Table 3.4-4. Project Design Parameters

Design Parameter
Air emission ratings of construction equipment engines
Port selection and location of construction laydown areas
Choice of cable-laying locations and pathways
Choice of marine traffic routes to and from the Lease Area
Number of offshore substations
Soil characteristics at excavation sites
Emission control strategy for fugitive emissions due to excavation and hauling operations

Variability of the Project design as a result of the PDE includes the number of WTGs and their spacing within the Lease Area, spatial coverage of the overall Lease Area, and the construction schedule. A reduction (or increase) in the number of WTGs installed and their associated IACs would likely have an associated reduction (or increase) in associated vessel and equipment use and their generated air emissions. Additionally, variations in the planned cable layout and landfall locations would impact the magnitude and spatial extent of emissions. Appendix D provides additional information about the PDE.

See Appendix E1 for a summary of IPFs analyzed for air quality across all action alternatives. IPFs that are either not applicable to the resource or determined by BOEM to have a negligible effect are excluded from Chapter 3 and provided in Table E1-1 in Appendix E1. Offshore and onshore IPFs are addressed separately in the analysis if appropriate for the resource; not all IPFs have both an offshore and onshore component. Where feasible, calculations for specific alternative impacts are provided in Appendix E4 to facilitate reader comparison across alternatives.

Table 3.4-5 discloses IPF findings carried forward for analysis in this section. Each alternative analysis discussion consists of the construction and installation phase, the O&M phase, the decommissioning phase, and the cumulative analysis. If these analyses are not substantially different, then they are presented as one discussion.

A detailed analysis of the Proposed Action follows the table. Detailed analysis of other considered action alternatives is also provided below the table if analysis indicates that the alternative(s) would result in substantially different impacts than the Proposed Action.

The conclusion section for each alternative analysis provides additional rationale for this impact determination. The overall impact of any alternative would be **moderate** adverse because the overall effects would be notable, but the resource would recover completely from adverse impacts without mitigation or remedial action.

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Table 3.4-5. Alternative Comparison Summary for Air Quality

Impact-Producing Factor	Alternative A (No Action Alternative)	Alternative B (Proposed Action) Up to 100 WTGs*	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
Air emissions and climate change	**Offshore:** During construction, impacts from future wind development activities on air quality would be temporary and **minor** to **moderate** adverse, depending on the extent and duration of emissions. Primary emission sources would include increased vessel and air traffic, combustion emissions from construction equipment, and fugitive emissions. Future offshore wind projects could also beneficially contribute to a broader combination of actions to reduce future impacts from climate change over the long term.	**Offshore:** Project construction would have a limited duration, and most emissions would occur offshore. The only air emissions anticipated during O&M would result from crew and maintenance vessels and helicopters. Therefore, impacts on air quality near populated areas would be temporary **minor** adverse. Project O&M would also generate long-term **minor** beneficial impacts by providing energy to the region from a renewable resource and due to avoided health events. The overall cumulative impacts associated with the Proposed Action when combined with other past, present, and reasonably foreseeable activities would be **moderate** adverse, although regional air quality could be improved over the Project life cycle when compared to the No Action Alternative.	**Offshore:** When compared to the maximum case for the Proposed Action, construction under Alternatives C through F could result in a decrease in Project-related emissions due to less trenching and/or vessel traffic to install a reduced number of WTGs and their associated IACs. In such cases, emissions from construction and installation would be less than the Proposed Action but still temporary **minor** adverse. Alternatives C through F could also result in reduced O&M emissions because fewer WTGs installed, when compared to the maximum case under the Proposed Action, would mean potentially reduced inspection time, fewer turbines needing regular maintenance, etc. Alternatives C through F would avoid similar amounts of emissions as the minimum and maximum avoided emission values for the Proposed Action presented in Table 3.4-13. During O&M, Alternatives C through F would also result in long-term minor beneficial impacts on regional air quality by substituting some existing fossil fuel sources with a renewable source, which would contribute to a long-term net decrease in emissions in the region. Therefore, overall impacts on air quality under Alternatives C through F would likely be **minor** adverse and long term **minor** beneficial. Alternatives C through F would result in impacts on air quality at quantities and durations similar to, or slightly reduced from, the Proposed Action. Although regional air quality could be improved when compared to the No Action Alternative, it would be too remote or speculative to conclude what that change would be. Given the marginal reduction, however, the cumulative impacts of Alternatives C through F on air quality when combined with past, present, and reasonably foreseeable activities would remain **moderate** adverse.				**Offshore:** Alternative G would reduce the number of allowable WTGs and their associated IACs, which would likely have a corresponding reduction in associated vessel and equipment use and air emissions compared to the Proposed Action. BOEM expects the impacts from this alternative would be similar to the Proposed Action: **minor** adverse due to air emissions from construction activities. Alternative G could also have fewer O&M emissions because there would be fewer WTGs to inspect and maintain compared to the Proposed Action. Alternative G would also contribute to long-term **minor** beneficial impacts by substituting some fossil fuel sources of electricity generation with a lower emitting renewable source and therefore would result in a net reduction in cumulative air emissions in the region. In the context of other reasonably foreseeable environmental trends and planned actions, BOEM expects that the alternative's impacts would be similar to the Proposed Action (with individual IPFs leading to impacts that would be short term **minor** adverse and long term **minor** beneficial). The overall cumulative impacts of Alternative G on air quality when combined with past, present, and reasonably foreseeable activities would therefore be the same as the Proposed Action: **moderate** adverse, with potential regional improvements to air quality when compared to the No Action Alternative.
	Onshore: Ongoing activities and reasonably foreseeable activities other than offshore wind would result in **moderate** adverse impacts on air quality, primarily driven by recent market and permitting trends indicating future electric generating units would most likely include natural gas–fired and oil-fired dual fuel facilities, a mix of natural gas, and dual fuel natural gas/oil.	**Onshore:** Air emissions generated by construction and O&M of the onshore facilities could have temporary **negligible** to **minor** adverse impacts on air quality. When combined with other onshore sources of air emissions, cumulative impacts on air quality from onshore Project activities would be long term **minor** adverse.	**Onshore:** Alternatives C through F would not impact onshore activities; therefore, construction and O&M impacts would be the same as those described for the Proposed Action: temporary, **negligible** to **minor** adverse. Cumulative impacts would also be the same as those described for the Proposed Action: long term **minor** adverse.				**Onshore:** Alternative G would not impact onshore activities. The impacts to air quality from construction and O&M of Alternative G would be the same as the Proposed Action: temporary, **negligible** to **minor** adverse. Likewise, the cumulative impacts would be the same as the cumulative impacts from the Proposed Action: long term **minor** adverse.

* If the Proposed Action were to select an 11- to 12–MW turbine, then the total number of WTGs installed and impacts from associated air emissions would be similar or the same as those under Alternatives C through F.

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3.4.2.2 Alternative A: Impacts of the No Action Alternative on Air Quality

3.4.2.2.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for air quality (see Section 3.4.1) would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities and by permitted and constructed offshore wind COP projects within the air quality GAA. These IPFs are described and analyzed in Appendix E1.

3.4.2.2.2 Cumulative Impacts

This section discloses potential cumulative air quality impacts associated with future offshore wind development (without the Proposed Action). The cumulative impact analysis for the No Action Alternative for planned non-offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E1.

Air emissions and climate change: Under the No Action Alternative, assuming no other future offshore wind projects are developed, electric generation needs would continue to be met by fossil fuel–generating technologies, resulting in more air emissions than what would be expected should future offshore wind development occur. Specific impacts would depend on the type of fossil fuel used (natural gas, oil, coal), the technology and pollution control systems chosen, and the site-specific issues associated with individual electric generation facilities. However, the continued use of existing fossil fuel–combusting electric generation sources would result in annual emissions that could have been avoided by using non–fossil fuel energy sources.

Using the EPA's Avoided Emissions and geneRation Tool (AVERT) version 4.1, avoided CO_2 emissions are calculated for the operational life of the Project with a capacity factor of 45% (AVERT offshore wind default) for the New England region based on the EPA's 2019 regional data file. More recent data are available, but because of the temporary declines in electricity demands, particularly from March through May 2020 likely caused by the COVID-19 pandemic, the EPA recommends using the 2019 regional data file when assessing annual, near-term future avoided emissions. Table 3.4-18 contains the associated annual CO_2e emissions (and avoided CO_2 emissions) for each alternative and the No Action Alternative. The No Action Alternative emissions were assumed equivalent to the emissions that would be avoided by the operation of the Proposed Action. The No Action Alternative (Alternative A) would result in no emissions during construction and O&M because the Project would not be built, but the No Action Alternative would also offer no avoided emissions, resulting in higher GHG emissions over the Project duration by not displacing traditional power generation via offshore wind. The missing avoided GHG emissions are equivalent to 268,076 gasoline-powered passenger vehicles driven each year. These figures are relative to the existing grid configuration, but the actual annual quantity of avoided emissions attributable to this proposed facility is expected to diminish over time if the electric grid becomes greener due to the addition of other renewable energy facilities and retirement of high-emitting generators.

Assuming the development of other future wind development and other renewable energy sources, these sources would decrease emissions over the long term, likely reduce the need for traditional fossil fuel power generation in the region, and could result in improved air quality when compared to expected air quality without other future wind development and renewable energy sources. Adjacent states have also proposed emission-reduction targets and renewable goals that overlap the operations of the Project and that are aimed at reducing air emissions and shifting energy sources from traditional fossil fuel generation to cleaner sources of energy. These plans could further reduce, but would not eliminate, air emissions.

During construction, impacts from future wind development activities on air quality under the No Action Alternative would be temporary **minor** to **moderate** adverse, depending on the extent and duration of emissions. Primary emission sources would include increased vessel and air traffic, combustion emissions from construction equipment, and fugitive emissions. Engine idling time would be limited in the Lease Area, as recommended by BOEM. Furthermore, best available control technology or lowest achievable emission rate requirements for vessels operating as OCS sources may be as stringent as Tier 4 engine standards (the EPA's strictest emission requirements for diesel engines) and would be determined by the EPA's OCS air permit.

Based on assumed construction schedules, offshore wind development would occur with overlapping construction schedules between 2022 and 2030. As shown in Table 3.4-6, construction of these projects in the GAA with sufficient details to estimate emissions would generate an estimated 124,277 tons of NO_X, 2,684 tons of SO_2, 5,795 tons of PM_{10}, and 7,709,706 metric tons of CO_2e over the 8-year construction period. For comparison purposes, according to the EPA's 2017 National Emissions Inventory, Suffolk County reported 8,122 tons of NO_X, 124 tons of SO_2, and 872 tons of PM_{10} from highway vehicles; 6,566 tons of NO_X, 34 tons of SO_2, and 537 tons of PM_{10} from off-highway vehicles; and 860 tons of NO_X, 421 tons of SO_2, and 146 tons of PM_{10} from electrical utilities' combustion of fuel (EPA 2020a). Similarly, future offshore wind project GHG emissions during construction would be negligible (7,709,706 metric tons of CO_2e) as compared to aggregate global emissions, and these projects could beneficially contribute to a broader combination of actions to reduce future impacts from climate change over the long term. An analysis by Barthelmie and Pryor (2021) calculated that, depending on global trends in GHG emissions and the amount of wind energy expansion, development of wind energy could reduce predicted increases in global surface temperature by 0.3 to 0.8 degrees Celsius (°C) (0.5–1.4 degrees Fahrenheit [°F]) by 2100.

As shown in Table 3.4-7, the O&M of future offshore wind projects in the GAA would have a proportionally small contribution of long-term and intermittent emissions, including 2,940 tons of NO_X, 44 tons of SO_2, 110 tons of PM_{10}, and 700,114 metric tons of CO_2e.

3.4.2.2.3 Conclusions

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and decommissioning would not occur; and potential impacts on air quality associated with the Project would not occur. However, ongoing and future activities would have continuing temporary to long-term impacts on air quality, primarily through construction-related air emissions.

BOEM anticipates that the impacts of ongoing activities, such as air emissions and GHGs, would be **moderate** adverse. In addition to ongoing activities, reasonably foreseeable activities other than offshore wind could also contribute to impacts on air quality. Reasonably foreseeable activities, other than offshore wind, that will increase air emissions and GHGs include construction and operation of new energy generation facilities to meet future power demands as transportation and heating become increasingly electrified. Although states are developing onshore renewable energy facilities (through their state energy plans) to the extent practicable to help meet future demand, these state plans also depend on the development of offshore wind. Therefore, under the No Action Alternative, to the extent that offshore wind is not developed, there would be a shortfall from planned renewable power generation, and nonrenewable sources would likely be needed to meet future demand. These facilities could include new natural gas–fired power plants or coal-fired, oil-fired, or clean coal–fired plants. Areas of nonattainment would be faced with potentially increased emissions or struggle to meet air quality goals. BOEM anticipates that the impacts of reasonably foreseeable activities other than offshore wind would be **moderate** adverse. BOEM expects the combination of ongoing activities and reasonably foreseeable activities other than offshore wind to result in **moderate** adverse impacts on air quality, primarily driven by recent market and permitting trends indicating future electric generating units would most likely include natural gas–fired and oil-fired dual fuel facilities, a mix of natural gas, and dual fuel natural gas/oil.

Considering all the IPFs together, BOEM anticipates that the impacts associated with future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would be **minor** to **moderate** adverse. Emissions generated from construction and decommissioning of the offshore wind projects would be the primary source of impacts to air quality. Other future offshore wind projects could also lead to reduced emissions from fossil fuel–combusting power generation facilities, resulting in **minor** to **moderate** beneficial impacts on air quality.

Table 3.4-6. Projected Construction Emissions (tons) for Carbon Dioxide and Regulated Pollutants for Projects in the Geographic Analysis Area from 2022 to 2030

Project	CO_2e	NO_X	SO_2	CO	PM_{10}	$PM_{2.5}$	VOC
Block Island (state waters)	42,940	585.96	0.424	101.16	37.15	N/A	25.73
Total State Waters	**42,940**	**585.96**	**0.42**	**101.16**	**37.15**	**N/A**	**25.73**
Vineyard Wind 1 part of OCS-A 0501	250,920	4,961.00	38.00	1,116.00	172.00	125.00	122.00
New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	393,627	5,917.00	41.00	1,406.00	238.00	230.00	124.00
Sunrise, OCS-A 0487	230,504	2,092.80	2.10	869.40	38.60	38.60	49.10
South Fork, OCS-A 0517	97,026	521.50	3.60	80.70	17.50	16.90	11.70
New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	520,958	7,732.00	54.00	1,841.00	339.00	329.00	164.00
South Coast Wind, OCS-A 0521	2,633,405	39,965.00	1,556.00	8,284.00	2,897.00	1,566.00	1,590.00
Beacon Wind, part of OCS-A 0520	1,012,652	17,677.13	507.50	1,757.69	290.39	269.87	729.55
Vineyard Northeast Wind (OCS-A 0522)	1,246,612	17,298.00	133.10	4,087.00	635.00	613.00	390.00
OCS-A 0500 remainder	976,300	15,222.71	286.81	3,239.29	678.96	464.72	396.64
Bay State Wind, part of OCS-A 0500	304,762	12,304.27	61.01	2,936.89	451.61	74.52	148.83
Total MA/RI Leases (without Proposed Action)	**7,666,766**	**123,691.40**	**2,683.12**	**25,617.97**	**5,758.07**	**3,727.60**	**3,725.82**
OCS Total (without Proposed Action)	**7,709,706**	**124,277.36**	**2,684.54**	**25,719.13**	**5,795.22**	**3,727.60**	**3,751.55**

Source: BOEM (2021).

Note: N/A = not applicable.

Table 3.4-7. Projected Operations and Maintenance Emissions (tons) for Carbon Dioxide and Regulated Pollutants for Projects in the Geographic Analysis Area from 2022 to 2030

Project	CO_2e	NO_X	SO_2	CO	PM_{10}	$PM_{2.5}$	VOC
Block Island (state waters)	1,572	21.40	0.01	2.80	1.40	N/A	0.80
Total State Waters	**1,572**	**21.40**	**0.01**	**2.80**	**1.40**	**N/A**	**0.80**
Vineyard Wind 1 part of OCS-A 0501	342,121	71.00	0.90	18.00	12.30	12.00	2.00
New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	20,259	178.00	0.50	45.00	6.00	5.80	3.20
Sunrise, OCS-A 0487	20,242	183.80	0.20	76.30	3.40	3.40	4.30
South Fork, OCS-A 0517	18,894	92.90	0.50	17.30	3.00	2.80	1.90
New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	27,594	179.00	0.50	45.00	6.00	5.80	3.20
South Coast Wind, OCS-A 0521	48,898	729.00	28.00	180.00	24.00	19.00	13.00
Beacon Wind, part of OCS-A 0520	32,069	124.40	5.00	23.60	3.40	3.20	5.00
Vineyard Northeast Wind (OCS-A 0522)	86,780	773.00	2.60	196.00	26.00	25.00	14.00
OCS-A 0500 remainder	80,434	337.76	4.66	88.32	12.58	11.68	7.65
Bay State Wind, part of OCS-A 0500	21,252	249.93	0.98	64.77	11.73	11.38	6.73
Total MA/RI Leases (without Proposed Action)	**698,542**	**2,918.79**	**43.84**	**754.29**	**108.41**	**100.05**	**60.97**
Total	**700,114**	**2,940.19**	**43.85**	**757.09**	**109.81**	**100.05**	**61.77**

Source: BOEM (2021).

Note: N/A =not applicable.

3.4.2.3 Alternative B: Impacts of the Proposed Action on Air Quality

In their *Air Emissions Calculations and Methodology* technical report, Tech Environmental (2023) conservatively assumed that construction of the Project would only take 1 year. For estimating potential transit emissions, 11 regional ports that could be used during construction and O&M were considered (Table 3.4-8).

Table 3.4-8. Regional Ports Considered

Port Name	Location
Port of Providence	Providence County, Rhode Island
Port of Davisville at Quonset Point	Washington County, Rhode Island
Port of Montauk	Suffolk County, New York
Port Jefferson	Suffolk County, New York
Port of Brooklyn	Kings County, New York
Port of New London	New London County, Connecticut
Paulsboro Marine Terminal	Gloucester County, New Jersey
New Bedford Marine Commerce Terminal	Bristol County, Massachusetts
Cashman Shipyard in Quincy	Norfolk County, Massachusetts
Port of Norfolk	Norfolk City, Virginia
Sparrow’s Point	Baltimore County, Maryland

All ports except New York’s Port of Montauk, Port Jefferson, and Port of Brooklyn were used for estimating construction emissions. The three ports in New York and the Port of Davisville at Quonset Point in Rhode Island were used for estimating O&M emissions.

It was conservatively assumed that when there were multiple port options for a particular Project phase involving regular transit, the port used for the emission calculations was the one with the longest transit distance. In the cases where multiple ports were listed as potential ports for vessel activities, the emissions were conservatively allocated to all potential ports. This approach provides a very conservative estimate of potential emissions for each state.

O_3 emissions are not included in the air quality impact analyses presented herein. O_3 emissions cannot be easily quantified since O_3 formation is a byproduct of chemical reactions between VOC and NO_X caused by heat and sunlight and thus emissions of O_3 depend on local weather conditions.

3.4.2.3.1 Construction and Installation

Offshore Activities and Facilities

Air emissions and climate change: Table 3.4-9 presents a summary of the Project’s estimated offshore construction emissions emitted during a maximum-case scenario in which all construction activities would occur in a single year. Construction emissions occurring within 15.5 miles of on-land construction areas and port locations are compared to the emission inventories of the impacted counties.

Over the approximate 1-year construction period, Project air emissions from vessels, helicopters, generators, and fuel-burning equipment could have temporary, direct impacts on air quality. Estimated emissions for most pollutants occurring within 15.5 miles of on-land construction areas and port locations would represent a 16.0% or less temporary increase in air pollutants for counties within the GAA. NO_X construction emissions are more substantial in comparison to the counties' NO_X emissions (in the range of 2%–45%). However, these emissions would be temporary and could be reduced by implementing proposed EPMs (see Table F-1 in Appendix F). Furthermore, this is a conservative analysis of the impact of the construction emissions occurring within 15.5 miles of on-land construction areas and port locations because it assumes all of the emissions would directly affect the nearest county's air. Emissions occurring outside the OCS permit area within 15.5 miles of on-land construction areas and port locations would primarily result from transit vessels used to transport equipment and material. Vessel engines are required to meet certain emission standards and must use low-sulfur diesel fuel. Realistically, vessel transit emissions would be spread out over the transport route. Depending on wind conditions at the time of emissions, it is likely that not all emissions generated miles offshore would reach land. Therefore, Project construction activities would have a temporary **minor** adverse impact on New London, Gloucester, Baltimore, Providence, Washington, Bristol, and Norfolk City Counties' air quality.

Construction emissions occurring offshore in the OCS permit area are not compared to county emission inventories because only a portion of the generated construction emissions would actually reach nearby counties and would depend on wind conditions at the time the emissions are generated. The OCS air permitting process will require air dispersion modeling of these emissions to demonstrate compliance with the NAAQS. If the Project cannot demonstrate compliance, the permit would not be issued, and the Project would not proceed.

The emission totals presented in the analysis represent a worst-case construction scenario in which all construction activities would occur in a single year. Project construction would also have a limited duration, and most emissions would occur offshore. The emissions quantified in Table 3.4-9 would not be emitted entirely at a single point or port and would not continuously affect nearby populated areas. Therefore, impacts on air quality near populated areas would be temporary **minor** adverse.

Table 3.4-9. Summary of Geographic Analysis Area Offshore Construction Emissions (tpy)

Source	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	CO_2e
Construction Emissions within 15.5 Miles of Potential Project On-Land Construction Areas and Port Locations							
RWF-Connecticut	22.3	101.6	3.4	3.3	0.1	3.6	14,980
Percentage of New London County, Connecticut, emission inventory	0.09%	1.92%	0.12%	0.31%	0.03%	0.02%	0.76%
RWF-New Jersey	674.8	2,796.2	94.5	91.2	8.4	49.5	190,927
Percentage of Gloucester County, New Jersey, emission inventory	2.22%	44.66%	4.37%	6.95%	1.40%	0.47%	2.91%
RWF-Maryland	533.4	2,210.3	74.7	72.1	6.6	39.1	150,923
Percentage of Baltimore County, Maryland, emission inventory	0.74%	20.73%	0.61%	2.25%	0.63%	0.23%	3.03%
RWF-Rhode Island	169.5	711.7	24.1	23.3	2.2	14.8	56,604
RWEC-Rhode Island	62.8	260.5	8.7	8.4	0.8	4.6	18,169
Total Rhode Island	**232.3**	**972.2**	**32.8**	**31.7**	**3.0**	**19.4**	**74,773**
Percentage of Providence County, Rhode Island, emission inventory	0.50%	12.45%	0.73%	1.63%	0.63%	0.12%	1.47%
Percentage of Washington County, Rhode Island, emission inventory	1.60%	37.79%	2.80%	5.34%	2.88%	0.26%	11.65%
RWF-Massachusetts	175.4	734.6	24.9	24.0	2.1	14.9	58,274
RWEC-Massachusetts	88.6	367.0	15.7	12.1	1.1	6.5	25,598
Total Massachusetts	**264.0**	**1,101.6**	**40.6**	**36.1**	**3.2**	**21.4**	**83,872**
Percentage of Bristol County, Massachusetts, emission inventory	0.53%	12.39%	1.12%	1.93%	0.37%	0.13%	1.95%
Percentage of Norfolk County, Massachusetts, emission inventory	0.44%	11.02%	0.85%	1.84%	0.68%	0.14%	1.27%

Source	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	CO_2e
RWF-Virginia	613.5	2,551.6	86.2	83.2	7.5	47.0	182,269
Percentage of Norfolk City, Virginia, emission inventory	2.47%	41.85%	5.72%	12.09%	3.24%	0.80%	16.32%
RWF-maximum potential federal water	2,105.5	8,745.7	293.9	283.9	25.1	153.0	595,830
Outer Continental Shelf Permit Area Construction Emissions							
RWF	941.9	3,854.1	125.5	121.3	12.3	80.6	264,307
RWEC-OCS	65.7	270.0	9.0	8.7	0.9	4.8	17,961
Total OCS Permit Area Construction Emissions	**1,007.6**	**4,124.1**	**134.5**	**130.0**	**13.2**	**85.4**	**282,268**

Source: Tech Environmental (2023).

Notes:

RWF-Connecticut = the portion of RWF construction emissions that would occur beyond the OCS permit area and within 15.5 miles of shore during transit to and from the Port of New London.

RWF-New Jersey = the portion of RWF construction emissions that would occur beyond the OCS permit area and within 15.5 miles of shore during transit to and from the Paulsboro Marine Terminal.

RWF-Rhode Island = the portion of RWF construction emissions that would occur beyond the OCS permit area and within 15.5 miles of shore during transit to and from the Port of Providence and the Port of Davisville at Quonset Point.

RWEC-Rhode Island = the portion of RWEC offshore segment construction emissions that would occur outside the OCS permit area and within 15.5 miles of shore.

RWF-Maryland = the portion of RWF construction emissions that would occur beyond the OCS permit area and within 15.5 miles of shore during transit to and from Sparrow’s Point.

RWF-Massachusetts = the portion of RWF construction emissions that would occur beyond the OCS permit area and within 15.5 miles of shore during transit to and from the New Bedford Marine Commerce Terminal and during transit to and from European ports.

RWEC-Massachusetts = the portion of RWEC offshore segment construction emissions that would occur outside the OCS permit area and within 15.5 miles of shore.

RWF-Virginia = the portion of RWF construction emissions that would occur beyond the OCS permit area and within 15.5 miles of shore during transit to and from the Port of Norfolk and during transit to Sparrow’s Point.

RWEC-OCS = the portion of RWEC offshore segment construction emissions that would occur within the OCS permit area.

Onshore Activities and Facilities

Air emissions and climate change: Table 3.4-10 presents the estimated onshore construction emissions for the Project. The onshore facilities, inclusive of the landfall work area, onshore transmission cable, OnSS, and ICF (including associated interconnection circuits and Project easement), would be constructed in Davisville, Washington County, Rhode Island, which is in attainment for all pollutants.

Table 3.4-10. Summary of Emissions from Onshore Facilities Construction (tpy)

Source	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	CO_2e
OnSS and ICF	367.5	382.0	14.6	13.8	1.3	26.8	164,525
Onshore transmission cable	8.9	37.2	1.8	1.8	0.1	2.4	7,342
Horizontal directional drilling in the landfall work area	4.3	14.3	0.7	0.7	0.0	1.0	3,271
Total	**380.7**	**433.5**	**17.1**	**16.3**	**1.4**	**30.2**	**175,138**
Percentage of Kent County, Rhode Island, emission inventory	2.31%	20.26%	1.72%	2.94%	1.18%	0.53%	21.38%
Percentage of Providence County, Rhode Island, emission inventory	0.82%	5.55%	0.38%	0.84%	0.29%	0.18%	3.44%
Percentage of Washington County, Rhode Island, emission inventory	2.62%	16.85%	1.46%	2.74%	1.34%	0.40%	27.28%

Source: Tech Environmental (2023).

Construction of the onshore facilities is estimated to take 18 months, but the air technical report analysis conducted by Tech Environmental (2023) presumes that construction could occur as quickly as 1 year. Construction of the onshore facilities would involve emissions from on-road and non-road equipment, which could have temporary, direct impacts on air quality. The Port of Davisville at Quonset Point would be used for construction support activities. The estimated onshore facilities construction emissions for regulated pollutants were compared to county emission inventories for the counties within 15.5 miles of the Port of Davisville at Quonset Point (the GAA). The Proposed Action onshore facility construction NO_X emissions would be approximately 5.5% of Providence County, Rhode Island's annual NO_X emissions, 16.9% of Washington County, Rhode Island's annual NO_X emissions, and 20.3% of Kent County, Rhode Island's annual NO_X emissions. Most emissions of regulated pollutants were between 0.29% and 2.94% of Kent, Providence, or Washington Counties' annual emissions. Air emissions generated by constructing the onshore facilities could have temporary **minor** adverse impacts on air quality.

3.4.2.3.2 Operations and Maintenance and Decommissioning

Offshore Activities and Facilities

Air emissions and climate change: Emissions from the Project O&M would be much lower than those produced during construction because there would be no direct emissions associated with wind turbine operation. The only air emissions anticipated during O&M would result from crew and maintenance vessels and helicopters. Planned maintenance activities include annual turbine service and safety surveys, annual oil and lubricant changes, annual inspections of turbines and foundations, seafloor and submarine surveys, biannual electrical inspections, regular electrical component servicing, annual scheduled maintenance, and all major and minor corrective maintenance. Table 3.4-11 summarizes the Project O&M emissions estimated for the air quality GAA. Project O&M emissions occurring within 15.5 miles of on-land construction areas and port locations are compared to the emission inventories of the impacted counties. These O&M emissions occurring within 15.5 miles of on-land construction areas and port locations would increase the annual emissions of each pollutant by 1.5% or less for all counties within the GAA.

Project O&M emissions occurring offshore in the OCS permit area are not compared to county emission inventories because only a portion of these emissions would actually reach nearby counties, depending on wind conditions at the time of emission. The OCS air permitting process will require air dispersion modeling of these emissions to demonstrate compliance with the NAAQS. Therefore, Project O&M activities would have a **minor** adverse impact on the air quality in the counties in the GAA.

Project O&M would also generate long-term **minor** beneficial impacts by providing energy to the region from a renewable resource. Currently, the region in which this wind farm would serve obtains between 40% and 51% of its power through the combustion of natural gas (U.S. Energy Information Administration 2021). By replacing a portion of the air pollutant emissions generated by fossil fuel–fired power plants, significant reductions in air pollutants emissions can be achieved. A recent study of current wind projects found that there is a net reduction in emissions within 6 months of the commencement of operations (Inderscience Publishers 2014). Furthermore, as transportation and heating become increasingly electrified, the demand for electrical power will grow. Without offshore wind, states would not be able to meet their emission targets and meet this increasing demand.

Table 3.4-11. Summary of Offshore Operations and Maintenance Emissions (tpy)

Source	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	CO_2e
Operations and Maintenance Emissions within 15.5 Miles of Potential Project On-Land Areas and Port Locations							
RWF-New York	51.2	205.3	6.9	6.7	0.1	3.0	14,506
Percentage of Kings County, New York, emission inventory	0.09%	1.51%	0.14%	0.26%	0.02%	0.02%	0.28%
Percentage of Suffolk County, New York, emission inventory	0.03%	1.01%	0.07%	0.17%	0.01%	0.01%	0.14%
RWF-Rhode Island	3.3	13.0	0.4	0.4	0.0	0.3	1,001
Percentage of Washington County, Rhode Island, emission inventory	0.02%	0.51%	0.03%	0.07%	0.00%	0.00%	0.16%
Outer Continental Shelf Permit Area Emissions							
RWF	207.6	847.7	27.4	26.6	0.6	12.4	57,820

Source: Tech Environmental (2023).

Notes:

RWF-New York = the portion of RWF O&M emissions that would occur outside the OCS permit area and within 15.5 miles from shore during transit to and from the Port of Montauk, Port Jefferson, and the Port of Brooklyn.

RWF-Rhode Island = the portion of RWF O&M emissions that would occur beyond the OCS permit area and within 15.5 miles from shore during transit to and from the Port of Providence and the Port of Davisville at Quonset Point.

In the case of decommissioning, emissions would result largely from the operation of decommissioning equipment and vessels or aircraft. Associated air emissions would occur 35 years in the future when air quality conditions, emissions technology, and regulations would be different; therefore, estimating decommissioning emission impacts now is speculative. Because portions of the Project would be decommissioned in place, fewer decommissioning activities and less equipment would be required; therefore emissions from decommissioning activities would be less than those from construction activities. The decommissioning activities would be subject to a future OCS air permit, or similar, application. There would be no further air emissions from RWF once decommissioning is complete.

The use of wind to generate electricity reduces the need for electricity generation from new traditional fossil fuel–powered plants in New England that produce GHG emissions. BOEM obtained avoided emissions from EPA's AVERT Excel Edition, Version 4.1 for the New England region based on EPA's 2019 regional data file. Regional data for 2020 is available, but due to the temporary declines in electricity demands, particularly from March through May 2020 likely caused by the pandemic, the EPA recommends using the 2019 regional data file when assessing annual, near-term future avoided emissions. The EPA's AVERT is not a long-term projection tool. It is not intended to analyze avoided emissions more than 5 years from baseline. To provide a very rough estimate of the long-term avoided emissions of the Project, the maximum and minimum annual avoided emissions estimated by AVERT were multiplied by 35 years (to represent the lifetime avoided emissions). The CO_2 emissions produced by the New York electric grid from traditional fossil fuel–fired power plants that would be displaced by the Proposed Action are presented in Table 3.4-16. The Proposed Action would result in a net annual reduction of 1,357,865 tons of CO_2, which is the equivalent of the removal of 274,120 gasoline-powered passenger vehicles driven per year, with a lifetime reduction of 47,525,275 tons of CO_2.

The EPA's CO-Benefits Risk Assessment (COBRA) screening model Desktop Edition, Version 4.1 was used to estimate the health impacts of avoided emissions in the United States and in the combined area of Connecticut, Maryland, Massachusetts, New Jersey, New York, Rhode Island, and Virginia. The model used the following inputs: 2023 was selected as the analysis year to estimate the health impacts of emissions changes. New York was selected as the state where the emission changes would occur; Fuel Combustion: Electric Utility was the sector where the emission changes would occur; and the AVERT output file for the minimum annual avoided emissions for NO_X, SO_2, $PM_{2.5}$, VOC, and NH_3 was loaded into the COBRA application. The model provides estimated ranges of reduced occurrences of health events caused by air pollution, such as mortality, nonfatal heart attacks, and hospitalizations. It also estimates the total health benefit, which encompasses all saved costs of the avoided health events. COBRA includes a discount rate of either 3%, to account for the interest that may be earned from government backed securities, or 7%, to account for private capital opportunity costs. Monetary values presented are in 2017 dollars. The EPA recommends using both for a bounding approach. For the entire United States, COBRA estimates that the total health benefit ranges from $12,096,077 to $27,290,022 at a 3% discount rate and from $10,793,564 to $24,334,469 at a 7% discount rate. COBRA estimates statistical lives saved within the entire United States to range from 1.09 to 2.46 (EPA 2020b). For Connecticut, Maryland, Massachusetts, New Jersey, New York, Rhode Island, and Virginia, combined, COBRA estimates that the total health benefit ranges from $9,891,082 to $22,309,940 at a 3% discount rate and from $8,826,280 to $19,893,704 at a 7% discount rate. COBRA estimates statistical lives saved within Connecticut, Maryland, Massachusetts, New Jersey, New York, Rhode Island, and Virginia, combined, to range from 0.89 to 2.01 (EPA 2020b). For a 5-year estimate for the United States, the total health benefit ranges from $60,480,383 to $136,450,108 at a 3% discount rate and from $53,967,819 to $121,672,344 at a 7% discount rate. Over the course of 5 years, the statistical lives saved within the entire United States is between 5.44 and 12.31. This 5-year estimate is representative of the avoided emissions during operations only. This would represent a long-term **minor** beneficial impact due to avoided health events.

Onshore Activities and Facilities

Air emissions and climate change: Onshore O&M activities would include periodic inspections, preventative maintenance, and regular equipment servicing. Table 3.4-12 presents the estimated onshore facilities O&M emissions for the Project. Annual O&M emissions from onshore facilities range from < 0.01% to 0.01% of Kent, Providence, and Washington Counties' annual emissions. Impacts on air quality from Project onshore facilities' O&M emissions would be **negligible** adverse.

Table 3.4-12. Summary of Emissions from Onshore Facilities Operations and Maintenance (tpy)

Source, State	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	CO_2e
Onshore facilities, Rhode Island	0.6	0.2	0.0	0.0	0.0	0.0	22
Total	**0.6**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**22**
Percentage of Kent County, Rhode Island, emission inventory	< 0.01%	0.01%	< 0.01%	< 0.01%	< 0.01%	< 0.01%	< 0.01%
Percentage of Providence County, Rhode Island, emission inventory	< 0.01%	< 0.01%	< 0.01%	< 0.01%	< 0.01%	< 0.01%	< 0.01%
Percentage of Washington County, Rhode Island, emission inventory	< 0.01%	0.01%	< 0.01%	< 0.01%	< 0.01%	< 0.01%	< 0.01%

Source: Tech Environmental (2023).

Decommissioning activities associated with the onshore facilities would not likely impact air quality in the region. Associated air emissions would occur 35 years in the future when air quality conditions, emissions technology, and regulations would be different; therefore, estimating decommissioning emission impacts now is speculative. Because portions of the Project would be decommissioned in place, fewer decommissioning activities and less equipment would be required; therefore emissions from decommissioning activities would be less than those from construction activities. There would be no further air emissions from RWF once decommissioning is complete.

3.4.2.3.3 Cumulative Impacts

Offshore Activities and Facilities

Air emissions and climate change: Construction and installation, O&M, and decommissioning emissions associated with the Proposed Action would result in temporary moderate adverse, long-term minor adverse, and long-term minor beneficial impacts on air quality. The Proposed Action's construction emissions (see Tables 3.4-10 and 3.4-13) would noticeably increase emissions of regulated pollutants over the construction emissions generated by other offshore wind projects associated with the No Action

Alternative (see Table 3.4-5). Therefore, total cumulative construction-related air emissions from all planned offshore wind energy projects, including the Proposed Action, in the Massachusetts Wind Energy Area (MA WEA) would consist of an estimated 128,401 tons of NO_X, 2,697 tons of SO_2, 5,930 tons of PM_{10}, and 7,991,974 tons of CO_2e. However, these effects would be localized and would cease when Project construction is complete.

Table 3.4-13 combines the total estimated construction emissions contributed by the Proposed Action within the OCS air permit area with the estimated local construction emissions that occur beyond the OCS air permit area and within 15.5 miles of shore (RWF-New Jersey, RWF-Massachusetts, RWEC-Rhode Island, etc.). The totals are not compared to county emission inventories because only portions of the Proposed Action construction emissions generated offshore within the OCS air permit area would reach nearby counties, depending on wind conditions at the time of emission. The OCS air permitting process will require air dispersion modeling of these emissions to demonstrate compliance with the NAAQS.

Table 3.4-13. Geographic Analysis Area Offshore Cumulative Construction Emissions (tpy)

Source, State	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	CO_2e
Connecticut							
RWF-Connecticut	22.3	101.6	3.4	3.3	0.1	3.6	14,980
RWF-OCS	941.9	3,854.1	125.5	121.3	12.3	80.6	264,307
RWEC-OCS	65.7	270.0	9.0	8.7	0.9	4.8	17,961
Total Connecticut Emissions	**1,029.9**	**4,225.7**	**137.9**	**133.3**	**13.3**	**89.0**	**297,248**
New Jersey							
RWF-New Jersey	674.8	2,796.2	94.5	91.2	8.4	49.5	190,927
RWF-OCS	941.9	3,854.1	125.5	121.3	12.3	80.6	264,307
RWEC-OCS	65.7	270.0	9.0	8.7	0.9	4.8	17,961
Total New Jersey Emissions	**1,682.4**	**6,920.3**	**229.0**	**221.2**	**21.6**	**134.9**	**473,195**
Maryland							
RWF-Maryland	533.4	2,210.3	74.7	72.1	6.6	39.1	150,923
RWF-OCS	941.9	3,854.1	125.5	121.3	12.3	80.6	264,307
RWEC-OCS	65.7	270.0	9.0	8.7	0.9	4.8	17,961
Total Maryland Emissions	**1,541.0**	**6,334.4**	**209.2**	**202.1**	**19.8**	**124.5**	**433,191**
Rhode Island							
RWF-Rhode Island	169.5	711.7	24.1	23.3	2.2	14.8	56,604
RWEC-Rhode Island	62.8	260.5	8.7	8.4	0.8	4.6	18,169
RWF-OCS	941.9	3,854.1	125.5	121.3	12.3	80.6	264,307
RWEC-OCS	65.7	270.0	9.0	8.7	0.9	4.8	17,961
Total Rhode Island Emissions	**1,239.9**	**5,096.3**	**167.3**	**161.7**	**16.2**	**104.8**	**357,041**

Source, State	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	CO_2e
Massachusetts							
RWF-Massachusetts	175.4	734.6	24.9	24.0	2.1	14.9	58,274
RWEC-Massachusetts	88.6	367.0	15.7	12.1	1.1	6.5	25,598
RWF-OCS	941.9	3,854.1	125.5	121.3	12.3	80.6	264,307
RWEC-OCS	65.7	270.0	9.0	8.7	0.9	4.8	17,961
Total Massachusetts Emissions	**1,271.6**	**5,225.7**	**175.1**	**166.1**	**16.4**	**106.8**	**366,140**
Virginia							
RWF-Virginia	613.5	2,551.6	86.2	83.2	7.5	47.0	182,269
RWF-OCS	941.9	3,854.1	125.5	121.3	12.3	80.6	264,307
RWEC-OCS	65.7	270.0	9.0	8.7	0.9	4.8	17,961
Total Virginia Emissions	**1,621.1**	**6,675.7**	**220.7**	**213.2**	**20.7**	**132.4**	**464,537**

Source: Tech Environmental (2023).

Notes:

RWF-Connecticut = the portion of RWF construction emissions that would occur beyond the OCS permit area and within 15.5 miles of shore during transit to and from the Port of New London.

RWF-New Jersey = the portion of RWF construction emissions that would occur beyond the OCS permit area and within 15.5 miles of shore during transit to and from the Paulsboro Marine Terminal.

RWF-Rhode Island = the portion of RWF construction emissions that would occur beyond the OCS permit area and within 15.5 miles of shore during transit to and from the Port of Providence and the Port of Davisville at Quonset Point.

RWEC-Rhode Island = the portion of RWEC offshore segment construction emissions that would occur outside the OCS permit area and within 15.5 miles of shore.

RWF-Maryland = the portion of RWF construction emissions that would occur beyond the OCS permit area and within 15.5 miles of shore during transit to and from Sparrow’s Point.

RWF-Massachusetts = the portion of RWF construction emissions that would occur beyond the OCS permit area and within 15.5 miles of shore during transit to and from the New Bedford Marine Commerce Terminal and during transit to and from European ports.

RWEC-Massachusetts = the portion of RWEC offshore segment construction emissions that would occur outside the OCS permit area and within 15.5 miles of shore.

RWF-Virginia = the portion of RWF construction emissions that would occur beyond the OCS permit area and within 15.5 miles of shore during transit to and from the Port of Norfolk and during transit to Sparrow’s Point.

RWEC-OCS = the portion of RWEC offshore segment construction emissions that would occur within the OCS permit area.

RWF-OCS = the portion of RWF construction emissions that occur within the OCS permit area.

Air quality impacts from O&M of the Proposed Action, provided in Tables 3.4-11 and 3.4-12, would combine with the air quality impacts from all other O&M activities that could occur under the No Action Alternative (see Table 3.4-8), albeit at lower emission quantities compared to the construction and installation period. O&M emissions would noticeably add emissions in localized areas, several times per year, for the life of the Project. Total cumulative operation-related air emissions from all of the planned wind projects, including the Proposed Action, in the Massachusetts WEA would consist of an estimated 3,788 tons of NO_X, 44 tons of SO_2, 137 tons of PM_{10}, and 757,202 tons of CO_2e.

Table 3.4-14 combines the total estimated annual O&M emissions contributed by the Proposed Action within the OCS air permit area with the estimated annual O&M emissions emitted by the Proposed Action within 15.5 miles of the on-land areas and port locations in New York (RWF-New York). When this summed conservative total is compared to the 2017 National Emission Inventory for Kings and Suffolk Counties, New York, Kings County would see a 0.2% to 7.8% increase (depending on the pollutant) in its regulated pollutant annual emissions, whereas Suffolk County would see a 0.06% to 5.2% increase in its regulated pollutant annual emissions. Similarly, Table 3.4-14 combines the total annual O&M emissions emitted by the Proposed Action within the OCS air permit area with the estimated annual O&M emissions emitted by the Proposed Action within 15.5 miles of the on-land areas and port locations in Rhode Island (RWF – Rhode Island). When this summed conservative total is compared to Washington County, Rhode Island's 2017 National Emission Inventory, there would be a 0.6% to 33.5% increase in its regulated pollutant annual emissions. These are very conservative estimated increases because not all of the annual O&M emissions generated within the OCS air permit area would impact each nearby county in turn. Instead, only a portion of emissions generated within the OCS air permit area would actually reach land, depending on wind conditions at the time of emission.

Table 3.4-14. Geographic Analysis Area Offshore Cumulative Operations and Maintenance Emissions (tpy)

Source, State	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	CO_2e
New York							
RWF-New York	51.2	205.3	6.9	6.7	0.1	3.0	14,506
RWF-OCS	207.6	847.7	27.4	26.6	0.6	12.4	57,820
Total New York Emissions	**258.8**	**1,053.0**	**34.3**	**33.3**	**0.7**	**15.4**	**72,326**
Percentage of Kings County, New York, emission inventory	0.44%	7.76%	0.69%	1.30%	0.15%	0.09%	1.41%
Percentage of Suffolk County, New York, emission inventory	0.18%	5.18%	0.35%	0.86%	0.06%	0.05%	0.69%
Rhode Island							
RWF-Rhode Island	3.3	13.0	0.4	0.4	0.0	0.3	1,001
RWF-OCS	207.6	847.7	27.4	26.6	0.6	12.4	57,820
Total Rhode Island Emissions	**210.9**	**860.7**	**27.8**	**27.0**	**0.6**	**12.7**	**58,821**
Percentage of Washington County, Rhode Island, emission inventory	1.45%	33.46%	2.37%	4.55%	0.58%	0.17%	9.16%

Source: Tech Environmental (2023).

Notes:

RWF-New York = the portion of RWF O&M emissions that would occur outside the OCS permit area and within 15.5 miles from shore during transit to and from the Port of Montauk, Port Jefferson, and the Port of Brooklyn.

RWF-Rhode Island = the portion of RWF O&M emissions that would occur beyond the OCS permit area and within 15.5 miles from shore during transit to and from the Port of Providence and the Port of Davisville at Quonset Point.

RWF-OCS = the portion of RWF construction emissions that occur within the OCS permit area.

The Proposed Action would also have a noticeable contribution on existing GHG emissions. The construction and installation, O&M, and the eventual decommissioning of the Proposed Action would generate approximately 2,447,102 metric tons more CO_2e emissions over the No Action Alternative within the OCS air permit area. However, these contributions are small in proportion to aggregate national and global emissions. In 2019, U.S. GHG emissions totaled 6,558 million metric tons of CO_2e (EPA 2021c).

While cumulative air emissions in the region would increase during construction, the Project could also contribute to a long-term, cumulative net decrease in emissions by substituting some existing fossil fuel sources with a renewable source. As calculated in AVERT v4.1, the Proposed Action would avoid an estimated minimum of 235 tons of NO_X, 103 tons of SO_2, 41 tons of $PM_{2.5}$, 26 tons of VOC, 37 tons of NH_3, and 1,415,685 tons of CO_2 every year and would avoid an estimated maximum of 292 tons of NO_X, 126 tons of SO_2, 51 tons of $PM_{2.5}$, 33 tons of VOC, 46 tons of NH_3, and 1,771,439 tons of CO_2 every year by providing energy generation that existing fossil fuel–generated energy sources would have otherwise provided (EPA 2020c). This represents up to an estimated 5.3% to 6.2% increase in avoided emissions over the No Action Alternative on an annual basis. When combined with estimated avoided emissions from other offshore wind projects in the GAA, an estimated minimum of 4,582 tons of NO_X, 1,892 tons of SO_2, 803 tons of $PM_{2.5}$, 522 tons of VOC, 726 tons of NH_3, and 28,143,672 tons of CO_2 could cumulatively be avoided every year and an estimated maximum of 4,897 tons of NO_X, 2,017 tons of SO_2, 859 tons of $PM_{2.5}$, 559 tons of VOC, 776 tons of NH_3, and 30,111,159 tons of CO_2 could cumulatively be avoided every year.

Based on the above considerations, BOEM anticipates that the overall cumulative impacts associated with the Proposed Action when combined with other past, present, and reasonably foreseeable activities would be **moderate** adverse, although regional air quality could be improved over the Project life cycle when compared to the No Action Alternative.

The Social Cost of Carbon, now referred to as the Social Cost of GHG (SC-GHG), attempts to quantify the monetary value of net damages from climate change. The SC-GHG is the estimated cost resulting from the addition of GHG emissions to the atmosphere. SC-GHG values for use in analysis are derived on a per-metric ton basis for CO_2, CH_4, and N_2O for each emission year from 2020 to 2050. Higher global warming potential GHGs such as CH_4 and N_2O have a higher SC-GHG on a per metric ton basis than CO_2. The intention in the analysis is to include the value of all climate change impacts, including changes in net agricultural productivity, human health effects, property damage from increased flood risk natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services (Interagency Working Group on Social Cost of Greenhouse Gases [IWG] 2021). EO 12866 (Regulatory Planning and Review) directs agencies to "base decisions on the best reasonably obtainable scientific, technical, economic, and other information." EO 13990 (Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis) reinstates the IWG and directs it to publish an interim update to the SC-GHG, which includes a method to estimate the social cost of CO_2, CH_4, and N_2O. The interim SC-GHG estimates presented in *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide* were published on February 26, 2021, and are used as the basis for this analysis (IWG 2021).

The interim SC-GHG estimates from IWG (2021) described above are used to contextualize GHG impacts in terms of economic damages. The cost attributable to 1 metric ton of each GHG emitted is estimated based on the year emitted and the estimated global economic damages discounted to their present value using the appropriate discount rate. The estimated costs in Table 3.4-15 were calculated for the Project based on the calculated emission estimates.

Table 3.4-15. Social Cost of Greenhouse Gases from Revolution Wind Farm (2020 $)

Social Cost Metric	5% Discount Rate – Average	3% Discount Rate – Average	2.5% Discount Rate – Average	3% Discount Rate – 95th percentile
SC-CO_2	$25,364,349	$102,345,778	$157,342,814	$311,327,904
SC-CH_4	$12,119	$31,504	$43,031	$83,838
SC-N_2O	$439,500	$1,623,132	$2,482,422	$4,315,390
Total	$25,815,968	$104,000,414	$159,868,267	$315,727,133

Significant uncertainty exists in the SC-GHG estimates. Uncertainty is addressed in part through a combination of multi-model ensemble, probabilistic analysis, and scenario analysis. However, it is important to disclose that uncertainty is substantial (IWG 2021). These uncertainties do not all work in the same direction in terms of their influence on the SC-GHG estimates. However, it is the IWG's judgment that, taken together, the limitations suggest that the interim SC-GHG estimates presented in IWG (2021) likely underestimate the damages from GHG emissions. Uncertainties in the SC-GHG estimates stem from inherent uncertainties about what will happen in the future as well as known limitations in the models used to develop the SC-GHG estimates in IWG (2021).

Onshore Activities and Facilities

Air emissions and climate change: Project onshore facilities would result in temporary to long-term negligible to minor adverse air emissions as a result of on-road and non-road equipment use. The Proposed Action onshore facility construction NO_X emissions are approximately 5.5% of Providence County, Rhode Island's annual NO_X emissions, 16.9% of Washington County, Rhode Island's annual NO_X emissions and 20.3% of Kent County, Rhode Island's annual NO_X emissions.

Most O&M annual emissions of regulated pollutants were between 0.29% and 2.94% of Kent, Providence, or Washington Counties' annual emissions. Annual O&M emissions from onshore facilities would have a negligible adverse impact, ranging from < 0.01% to 0.01% of Kent, Providence, and Washington Counties' annual emissions. When combined with other onshore sources of air emissions, cumulative impacts on air quality would be long term **minor** adverse.

3.4.2.3.4 Conclusions

Construction and installation and decommissioning activities would cause increased air emissions temporarily. Emission sources from O&M activities would primarily use vehicles and vessels that emit less emissions than during construction and installation and decommissioning activities, and fewer annual trips would be needed. Therefore, BOEM expects the impact on air quality from the Proposed Action alone to be **minor** adverse due to air emissions from construction activities. While cumulative air emissions in the region would increase during construction, it is important to note that the Proposed Action could also contribute to a long-term net decrease in emissions by substituting some existing fossil fuel sources with a renewable source. By substituting some fossil fuel sources with a renewable source with less emissions, the Proposed Action would generate long-term **minor** beneficial impacts to regional air quality by contributing to a long-term net decrease in emissions in the region.

Considering all the IPFs together, BOEM anticipates that the overall cumulative impacts associated with the Proposed Action when combined with other past, present, and reasonably foreseeable activities would remain **moderate** adverse, although regional air quality could be improved when compared to the No Action Alternative.

3.4.2.4 Alternatives C, D, E, F

Table 3.4-5 provides a summary of IPF findings for these alternatives.

Using AVERT Version 4.1, avoided CO_2 emissions are calculated for the operational life of each alternative with a capacity factor of 45% (AVERT offshore wind default) and with a capacity between 704 MW and 891 MW for each alternative. Alternative F required a blend of capacity factors based on the seasonal variation in wind speeds in which the full 14-MW capacity of the turbines could be used in the four winter months between November and March with lower speeds throughout the rest of the year, resulting in a functional maximum capacity of 12 MW. This led to an adjusted annual capacity factor of 40.3%.

Table 3.4-16 contains the associated annual CO_2e emissions (and avoided CO_2 emissions) for Alternatives C through F. Alternative C1, excluding up to 35 WTG, is equivalent to 309,000 vehicles removed annually. Alternative C2, excluding up to 36 WTGs, has avoided GHG emissions equivalent to the removal of 304,229 vehicles per year. Alternative D, which excludes or relocates up to 22 WTGs, has net GHG emissions equivalent to the removal of 352,254 vehicles per year. Alternative E1, which excludes up to 36 WTGs, while also assuming a capacity of 11 MW, is an equivalent to the removal of 278,322 vehicles per year. Alternative E2, which excludes up to 19 WTGs and also assumes a capacity of 11 MW, has avoided GHG emissions equivalent to the removal of 352,668 vehicles per year. Alternative F would exclude up to 44 WTGs and assumes a capacity of 14 MW, has avoided GHG emissions equivalent to the removal of 249,405 vehicles per year. These figures are relative to the existing grid configuration, but the actual annual quantity of avoided emissions attributable to this proposed facility is expected to diminish over time if the electric grid becomes greener due to the addition of other renewable energy facilities and retirement of high-emitting generators.

3.4.2.4.1 Conclusions

Although Alternatives C through F would reduce the number of allowable WTGs and their associated IACs, which would likely have an associated reduction in associated vessel and equipment use and air emissions, BOEM expects the impacts from each alternative would be similar to the Proposed Action: **minor** adverse due to air emissions from construction activities. Project O&M would also contribute to long-term **minor** beneficial impacts by substituting some fossil fuel sources of electricity generation with a lower emitting renewable source and thus, would result in a net reduction in cumulative air emissions in the region.

In the context of other reasonably foreseeable environmental trends and planned actions, BOEM also expects that each alternative's impacts would be similar to the Proposed Action (with individual IPFs leading to impact that would be short term **minor** adverse and long term **minor** beneficial). The overall cumulative impacts of each alternative on air quality when combined with past, present, and reasonably foreseeable activities would therefore be the same as under the Proposed Action: **moderate** adverse, with potential regional improvements to air quality when compared to the No Action Alternative. Overall adverse effects would be notable, but the resource would recover completely from adverse impacts.

3.4.2.5 Alternative G

Table 3.4-5 provides a summary of IPF findings for this alternative.

Using AVERT Version 4.1, avoided CO_2 emissions are calculated for the operational life of Alternative G with a capacity factor of 45% (AVERT offshore wind default) and with a capacity of 704 MW. Table 3.4-16 contains the associated annual CO_2e emissions (and avoided CO_2 emissions) for Alternative G compared to the other alternatives. Alternative G excludes 35 WTGs, assumes a capacity of 704 MW, and has avoided GHG emissions equivalent to the removal of 278,206 gasoline-powered passenger vehicles per year.

3.4.2.5.1 Conclusions

Although Alternative G would reduce the number of allowable WTGs and their associated IACs, which would likely have an associated reduction in associated vessel and equipment use and air emissions, BOEM expects the impacts from this alternative would be similar to the Proposed Action—**minor** adverse—due to air emissions from construction activities. Project O&M would also contribute to long-term **minor** beneficial impacts by substituting some fossil fuel sources of electricity generation with a lower emitting renewable source and therefore would result in a net reduction in cumulative air emissions in the region.

In the context of other reasonably foreseeable environmental trends and planned actions, BOEM also expects that the alternative’s impacts would be similar to the Proposed Action (with individual IPFs leading to impacts that would be short term **minor** adverse and long term **minor** beneficial). The overall cumulative impacts of this alternative on air quality when combined with past, present, and reasonably foreseeable activities would therefore be the same as under the Proposed Action: **moderate** adverse, with potential regional improvements to air quality when compared to the No Action Alternative. Overall, adverse effects would be notable, but the resource would recover completely from adverse impacts.

Table 3.4-16 Avoided Emissions and Lifetime Net Emissions for Each Alternative

Alternative	Quantity of WTGs	Year 1 CO_2e Emissions (tons)	Annual CO_2e Emissions for Years 2–36 (tpy)	Annual Avoided CO2 Emissions for Years 2–36 (tpy)	Net Annual CO_2e Emissions for Years 2–36 (tpy)	Operational Lifetime Net CO_2e Emissions (tons)
Alternative A (No Action Alternative)	0 WTG	0	0	0	1,415,685	49,548,975
Alternative B (Proposed Action) at 704 MW	100 WTGs	282,268	57,820	1,415,685	-1,357,865	-47,525,275
Alternative B (Proposed Action) at 880 MW	100 WTGs	282,268	57,820	1,771,439	-1,713,619	-59,976,665
Alternative C1 (12 MW) at 780 MW	65 WTGs	183,474	37,583	1,568,224	-1,530,641	-53,572,431
Alternative C2 (12 MW) at 768 MW	64 WTGs	180,652	37,005	1,544,014	-1,507,009	-52,745,310
Alternative D (all at 12 MW) at 888 MW	74 WTGs	208,878	42,787	1,787,691	-1,744,904	-61,071,645
Alternative E1 (11 MW) at 704 MW	64 WTGs	180,652	37,005	1,415,685	-1,378,680	-48,253,807
Alternative E2 (11 MW) at 891 MW	81 WTGs	228,637	46,834	1,793,789	-1,746,954	-61,143,405
Alternative F (14 MW) at 704 MW	56 WTGs	158,070	32,379	1,267,816	-1,235,436	-43,240,275
Alternative G (11 MW) at 704 MW	65 WTG	183,474	37,583	1,415,685	-1,378,102	-48,233,570

3.4.2.6 Mitigation

No potential additional mitigation measures by BOEM for air quality are identified in Table F-3 in Appendix F. Any BOEM COP approval (with or without modifications) would require that Revolution Wind obtain an OCS air permit and comply with all permit requirements during construction activities. The EIS analysis assumes compliance with all other federal and state permit requirements under other statutes when evaluating impacts. Because any mitigation measures under the OCS air permit would be required no matter the alternative selected by BOEM, the application of those mitigation measures would not result in a change in impact-level determinations between the Proposed Action and Alternative G.

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3.5 Bats

3.5.1 Description of the Affected Environment and Environmental Consequences of the No Action Alternative for Bats

Geographic analysis area: Although historical anecdotal observations of bats up to 1,212 miles (1,950 km) offshore North America exist, recent offshore observations of tree bats range from 10.5 to 26.0 miles (16.9–41.8 km) (Hatch et al. 2013). For this reason, and to capture most of the movement range for migratory bat species, the GAA for bats consists of the United States coastline from Maine to Florida and extends 100 miles (160.9 km) offshore and 5 miles (8.05 km) inland to capture the movement range for species in this group (Figure 3.5-1).

Northern long-eared bat (*Myotis septentrionalis*), which has been recently reclassified as endangered under the ESA as of November 30, 2022 (USFWS 2022), and other cave bats typically do not occur on the OCS. Tree bats are long-distance migrants; their range includes most of the Atlantic Coast from Florida to Maine. Although these species have been documented on the open ocean and could encounter WTGs, use of offshore habitat is thought to be limited and generally restricted to spring and fall migration. The onshore limit of the GAA is 0.5 mile (0.8 km) inland to cover onshore habitats used by the bat species that may be affected by offshore components of the proposed Project as well as those species that could be affected by proposed onshore Project components. The onshore limit of the GAA is intended to cover most of the onshore habitat used by those bat species that may encounter the Project during most of their life cycles.

Affected environment: This section provides information on existing bat species and habitat trends from past and present activities. Bats within the GAA are subject to pressure from ongoing activities generally associated with onshore impacts, including onshore construction and climate change. Onshore construction activities and associated impacts are expected to continue at current trends and have the potential to result in impacts on bat species. The Vineyard Wind Final EIS (BOEM 2021a), the South Fork Wind Farm (SFWF) Final EIS (BOEM 2021b), and COP Appendix AA (Biodiversity Research Institute [BRI] 2023) provide detailed discussions of existing bat resources as well as bat species and habitat trends along the East Coast, which are incorporated by reference. Appendix E1 of this EIS provides additional information regarding past and present activities and associated impacts to bats.

Eight bat species are present in the state of Rhode Island, five of which are likely year-round residents. Bat species that may occur in the offshore and onshore portions of the Lease Area are the long-distance migrants and the non-migrating cave-dwelling bats. Long-distance migrants consist of hoary bat (*Lasiurus cinereus*), eastern red bat (*Lasiurus borealis*), and silver-haired bat (*Lasionycteris noctivagans*). Non-migratory cave dwellers consist of northern long-eared bat, little brown bat (*Myotis lucifugus*), eastern small-footed bat (*Myotis leibii*), big brown bat (*Eptesicus fuscus*), and tri-colored bat (*Perimyotis subflavus*) (see Table 2-3 in COP Appendix AA [BRI 2023]). Both groups of bats are nocturnal insectivores that use a variety of forested and open habitats for foraging during the summer (Barbour and Davis 1969). Cave-hibernating bats are generally not observed offshore (Dowling and O'Dell 2018) and in winter migrate from summer habitat to hibernacula in the region (Maslo and Leu 2013). Migratory tree bats fly to southern parts of the United States in the winter and have been observed offshore during migration (Hatch et al. 2013; Stantec Consulting Services Inc. [Stantec] 2016, 2018).

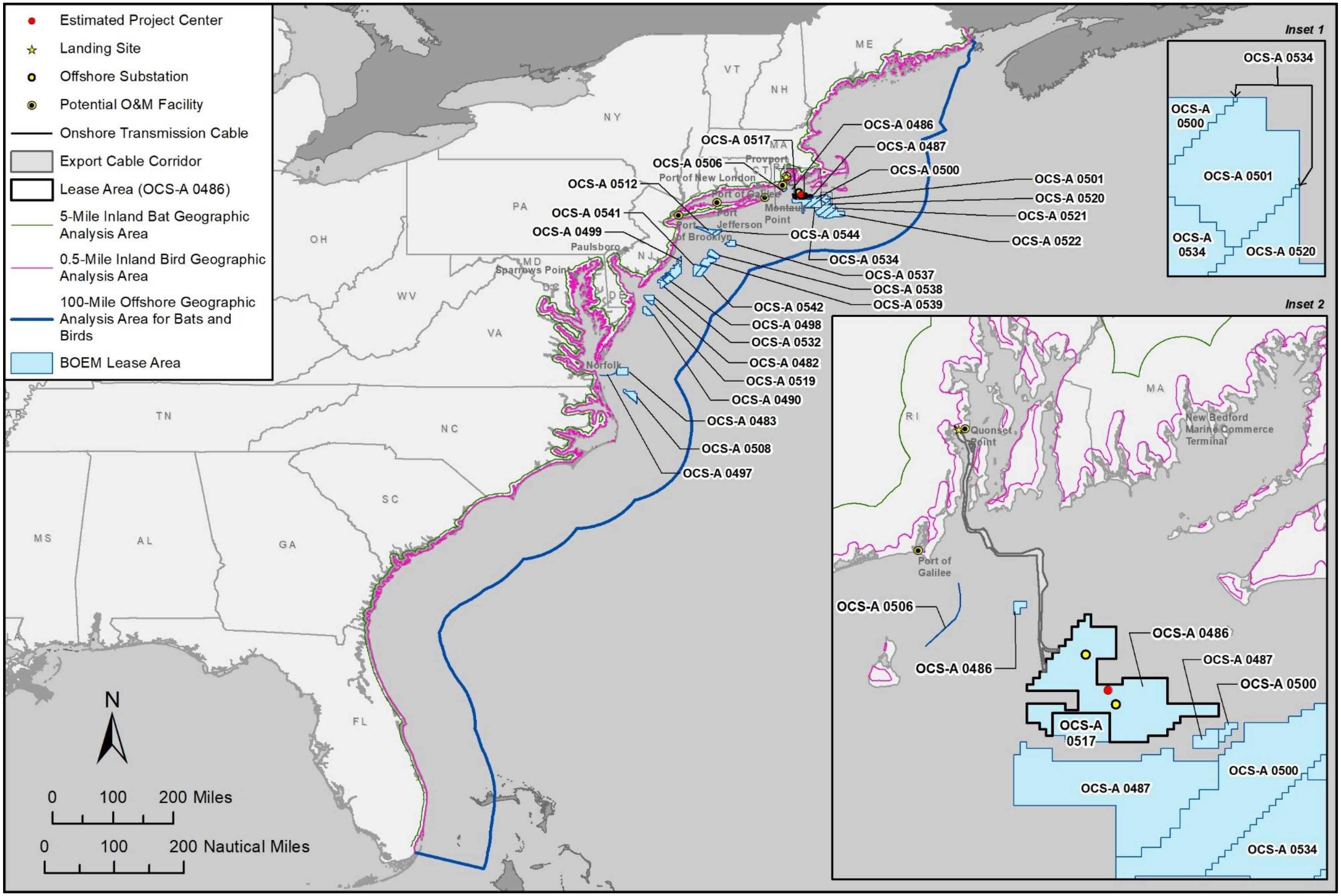

Figure 3.5-1. Geographic analysis area for bats.

Offshore

Although there is uncertainty on the specific movements of bats offshore, bats have been documented using the marine environment in the United States (Cryan and Brown 2007; Dowling and O'Dell 2018; Grady and Olson 2006; Hatch et al. 2013; Johnson et al. 2011; Stantec 2016). Bats have been observed to temporarily roost on structures, such as lighthouses on nearshore islands (Dowling et al. 2017). There is also historical evidence of bats, particularly eastern red bats, migrating offshore in the Atlantic (Hatch et al. 2013). In a Mid-Atlantic bat acoustic study conducted during the spring and fall of 2009 and 2010 (86 nights), the maximum distance that bats were detected from shore was 13.6 miles (21.9 km), and the mean distance was 5.2 miles (8.4 km) (Sjollema et al. 2014). In Maine, bats were detected on islands up to 25.8 miles (41.6 km) from the mainland (Peterson et al. 2014). In the Mid-Atlantic acoustic study (Sjollema et al. 2014), eastern red bats made up 78% (166 bat detections during 898 monitoring hours) of all bat detections offshore. This study also found that bat activity decreased as wind increased (Sjollema et al. 2014). In addition, eastern red bats were detected in the Mid-Atlantic up to 27.3 miles (44 km) offshore, outside the vicinity of islands or other structures, by high-resolution video aerial surveys (Hatch et al. 2013). Shipboard acoustic surveys conducted by Stantec in 2017 detected over 900 bat passes (primarily long-distance migratory tree bats) within the adjacent proposed SFWF Lease Area, export cable route, and adjacent offshore and coastal areas. Eastern red bats accounted for 69% of calls detected, whereas silver-haired bats accounted for 13%. All other species accounted for less than 5% of calls that were identified to species level. Peak detections for all species occurred during the month of August, suggesting that most offshore movement is associated with fall migration (Stantec 2018).

Several studies highlight the relationship between bat activity and weather conditions. Acoustic monitoring within the footprint of the proposed SFWF in southern New England found 82% of recorded bat passes with corresponding weather data occurred when wind speeds were < 5.0 meters/second (m/s) and temperatures were ≥ 15.0°C (Stantec 2018). This occurred during 49% of nighttime hourly rounded weather data increments during the monitoring period from July 14 to November 15. These weather conditions most often occurred from August through September. Bat activity occurred primarily during nights with warmer temperatures and low wind speeds, which has been likewise documented in several other studies (Fiedler 2004; Reynolds 2006; Stantec 2016). Similar monitoring at the operational Block Island Wind Farm in Rhode Island found that 90% of bat passes occurred at times when wind speeds were below 5.0 m/s and temperatures were at or above 15.0°C (Stantec 2018). Both studies reported very little activity at temperatures below 15.0°C, and most activity was documented at wind speeds between 2 and 4 m/s. Smith and McWilliams (2016) developed predictive models of regional nightly bat activity using continuous acoustic monitoring at several locations in coastal Rhode Island. Bat activity was found to steadily decrease with decreasing temperatures, and departures from seasonally normal temperatures increasingly inhibited bat activity later in the season (September through October). This study found no association between wind speed and bat activity, which contrasts with most other literature that shows bat activity is associated with relatively low wind speeds (Arnett et al. 2008; Cryan and Brown 2007; Fiedler 2004; Kerns et al. 2005), although wind speed data were regional and not site specific.

Cave-hibernating bats hibernate regionally in caves, mines, and other structures and primarily feed on insects in terrestrial and freshwater habitats. These species generally exhibit lower activity in the offshore environment than migratory tree bats (Sjollema et al. 2014), with movements primarily occurring during the fall. In the region, the maximum distance *Myotis* bats were detected offshore was 7.2 miles (11.5 km) (Sjollema et al. 2014). A recent nanotag tracking study on Martha's Vineyard recorded little brown bat (n = 3) movements off the island in late August and early September, with one individual flying from Martha's Vineyard to Cape Cod (Dowling et al. 2017). Big brown bats (n = 2) were also detected migrating from the island later in the year (October–November) (Dowling et al. 2017). These findings are supported by an acoustic study conducted on islands and buoys in the Gulf of Maine that indicated the greatest percentage of activity in July–October (Peterson et al. 2014). Presence in the Lease Area is considered rare for this group given the use of the coastline as a migratory pathway by cave-hibernating bats is likely limited to their fall migration period; acoustic studies indicate lower use of the offshore environment by cave-hibernating bats; and cave-hibernating bats do not regularly feed on insects over the ocean (BRI 2023).

Tree bats migrate south to overwinter and have been documented in the GAA's offshore environment (Hatch et al. 2013; Stantec 2018, 2019). Eastern red bats have been detected migrating from Martha's Vineyard late in the fall, with one individual tracked as far south as Maryland (Dowling et al. 2017). These results are supported by historical observations of eastern red bats offshore as well as recent acoustic survey results (Hatch et al. 2013; Peterson et al. 2014; Sjollema et al. 2014). Although little local data are available, shipboard and stationary acoustic surveys recorded several observations of bats flying over the ocean, with detections of migratory tree bats near the Lease Area (Stantec 2018). Tree bats may pass through the Lease Area during the migration period because they have been detected in the offshore environment primarily during late summer and fall. However, because bat movement offshore is generally limited to fall migration and bat activity offshore primarily occurs during wind speeds below 5.0 m/s, exposure to the Lease Area is expected to be relatively low as the average wind speeds in the Lease Area are between 5 and 10 m/s with stronger wind in the winter (BRI 2023:Section 4.2.4.1). Therefore, there is little evidence of bat use of the offshore environment and a relatively low proportion of the population is exposed.

Onshore

In July 2020, VHB performed acoustic presence-absence surveys for the federally threatened northern long-eared bat along the onshore transmission cable route and within the proposed OnSS parcel (VHB 2023a). Automated and qualitative analysis of acoustic data did not detect presence of the northern long-eared bat or the tri-colored bat, which is a candidate species for listing under the Endangered Species Act (ESA). Call data were auto classified with Bat Call Identification East, Version 2.8b, which resulted in the detection of the following species: big brown bat (n = 540 calls), eastern red bat (n = 891 calls), hoary bat (n = 23 calls), and silver-haired bat (n = 130 calls). Qualitative analysis of unknown species of concern calls confirmed 11 big brown bat calls and 135 eastern red bat calls (VHB 2023a).

Special-Status Bat Species

The official species list generated by the USFWS's Information for Planning and Consultation (IPaC) planning tool. on September 28, 2019, indicates that the federally endangered northern long-eared bat has the potential to occur within the footprint of the onshore facilities (VHB 2023b). The IPaC list also indicates that there are no critical habitats associated with the northern long-eared bat within the GAA. The range of the federally endangered Indiana bat (*Myotis sodalis*) does not include Rhode Island, and historical records of the Indiana bat demonstrate its presence only in Berkshire and Hampden Counties in Massachusetts (last recorded in 1939; Mass.gov 2019); however, a single tagged Indiana bat was detected in 2015 on Cape Cod and Nantucket (Motus Wildlife Tracking System 2015). The Indiana bat is also not among species of bats documented offshore (Pelletier et al. 2013; Stantec 2016). For these reasons, this assessment focuses solely on the potential occurrence of the northern long-eared bat within the GAA.

BOEM prepared a biological assessment (BA) for the potential effects on USFWS federally listed species under Section 7 of the ESA (BOEM 2022, 2023). The BA, as amended, was submitted to the USFWS on November 17, 2022, requesting initiation of consultation under Section 7 of the ESA, and the USFWS responded on November 25, 2022, with a letter of consultation initiation. The BA found that the Proposed Action *may affect but is not likely to adversely affect* listed species (BOEM 2022, 2023). BOEM requested concurrence on its conclusion that the impacts of the proposed onshore activities are expected to be discountable and insignificant and thus *may affect but are not likely to adversely affect* northern long-eared bat. There is no critical habitat designated for this species. In its final biological opinion, dated May 30, 2023, the USFWS concurred with BOEM's determination that the Project *may affect but is not likely to adversely affect* the northern long-eared bat because the best available information indicates the likelihood of the species occurring in the Lease Area is discountable (USFWS 2023).

Offshore, northern long-eared bats are generally not expected to occur within the Lease Area. A recent tracking study on Martha's Vineyard (n = 8; July–October 2016) did not record any offshore movements, and bats were presumed to hibernate on the island (Dowling et al. 2017). However, shipboard acoustic sampling near the SFWF detected a single northern long-eared bat call 21.1 miles (34 km) offshore (Stantec 2018). Most other northern long-eared bat passes detected during these surveys were 3 to 9 miles (5–14 km) offshore. Stationary acoustic detectors positioned on two turbines within the operational Block Island Wind Farm did not detect any northern long-eared bat calls (Stantec 2018, 2020). Similarly, vessel-based surveys at the construction site of the Block Island Wind Farm in 2016 did not detect any *Myotis* species (Stantec 2016). If northern long-eared bats were to migrate over water, most movements would likely be near the mainland. The related little brown bat has been documented migrating from Martha's Vineyard to Cape Cod, and northern long-eared bats may likewise migrate to mainland hibernacula from these islands in August and September (Dowling et al. 2017). Given there is little evidence of use of the offshore environment by northern long-eared bats and exposure is expected to be minimal, this species is not further assessed in the offshore environment. This conclusion is also consistent with the Vineyard Wind BA (BOEM 2020).

3.5.2 Environmental Consequences

3.5.2.1 Relevant Design Parameters, Impact-Producing Factors, and Potential Variances in Impacts

This assessment analyzes the maximum-case scenario; however, there is the potential for variances in the proposed Project build-out, as defined in the PDE (see Appendix D). The Project design parameters that would influence the magnitude of the impacts on bats include the number, size, and location of WTGs; the location of the OnSS and ICF; the type of lighting to be used; the location of construction within the landfall work area and within the transmission cable envelope; and the time of year during which construction occurs. Impacts associated with construction of the onshore elements of the Proposed Action during the active season for bats (generally April through October) could be avoided if onshore construction occurs outside this time frame.

The following EPMs would be implemented to minimize potential impacts to bats (see Appendix F, Table F-1):

- Revolution Wind evaluated siting alternatives for the OnSS using the criteria that included avoidance or minimization of disturbance to ecologically sensitive areas.
- Revolution Wind is committed to an indicative layout scenario with WTGs sited in a grid with approximately 1.15-mile (1-nm) × 1.15-mile (1-nm) spacing that aligns with other proposed adjacent offshore wind projects in the RI/MA WEA. This wide spacing of WTGs would allow avian and bat species to avoid individual WTGs and minimize risk of potential collision.
- The OnSS and ICF would be located on parcels that are already highly altered and include buried demolition waste.
- The transmission cable would be located primarily in unvegetated and previously disturbed or developed ROWs.
- To the extent feasible, tree and shrub removal for onshore facilities would occur outside the avian nesting and bat roosting period (May 1 through August 15). If tree and shrub removal cannot be avoided during this season, Revolution Wind would coordinate with appropriate agencies to determine appropriate course of action.
- Construction and operational lighting would be limited to the minimum necessary to ensure safety and to comply with applicable regulations.
- Revolution Wind would comply with FAA and USCG requirements for lighting while using lighting technology (e.g., low-intensity strobe lights) that minimize impacts on avian and bat species.
- Accidental spill or release of oils or other hazardous materials offshore would be managed through the OSRP.
- An SESC plan, including erosion and sedimentation control measures, would be implemented to minimize potential water quality impacts during construction and operation of the onshore facilities.
- Onshore facilities would be sited within previously disturbed and developed areas to the extent practicable.
- The onshore transmission cables would be buried and would therefore avoid the risk to avian and bat species associated with overhead lines.
- Revolution Wind would document any dead (or injured) birds/bats found incidentally on vessels and structures during construction, O&M, and decommissioning and provide an annual report to BOEM and USFWS.
- Revolution Wind would continue to coordinate with RIDEM and NOAA NMFS regarding TOY restrictions through the permitting process and would adhere to requirements imposed by these agencies.
- Revolution Wind previously committed to compliance with the northern long-eared bat 4(d) Rule (USFWS 2016b) to avoid and minimize long-term impacts on the species and sensitive upland habitats. However, the change in status from threatened to endangered nullified the prior 4(d) Rule that tailored protections for the species when it was listed as threatened. New interim

guidelines and protections have been issued by the USFWS. Revolution Wind would continue to coordinate with RIDEM and the USFWS to avoid and minimize adverse effects to northern long eared bats and would adhere to requirements imposed by these agencies.

These EPMs would be implemented across all alternatives; therefore, BOEM would not expect measurable potential variances in impacts across the alternatives.

See Appendix E1 for a summary of IPFs analyzed for bats across all action alternatives. IPFs that are either not applicable to the resource or determined by BOEM to have a negligible adverse impact are excluded from Chapter 3 and provided in Table E1-4 in Appendix E1. Offshore and onshore IPFs are addressed separately in the analysis if appropriate for the resource; not all IPFs have both an offshore and onshore component. Where feasible, calculations for specific alternative impacts are provided in Appendix E4, to facilitate reader comparison across alternatives.

Table 3.5-1 discloses IPF findings carried forward for analysis in this section. Each alternative analysis discussion consists of the construction and installation phase, the O&M phase, the decommissioning phase, and the cumulative analysis. If these analyses are not substantially different, then they are presented as one discussion.

The overall impact to bats from any action alternative would be **minor** adverse, as the effects would be small, and the resource would recover completely, with no mitigating action required. The conclusion section for each alternative analysis provides additional rationale for this impact determination.

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Table 3.5-1. Alternative Comparison Summary for Bats

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTGs	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
Cable emplacement/ maintenance	Only small amounts of habitat removal, if any, would be required by onshore power infrastructure construction and would occur in previously disturbed areas. Temporary to short-term impacts associated with habitat loss or avoidance during cable emplacement/maintenance may occur, but no injury or mortality of bat individuals would be expected. Cable emplacement/maintenance is therefore expected to have **negligible** adverse impacts on bats.	**Onshore**: The onshore transmission cable route would be located primarily in unvegetated and previously disturbed or developed ROWs that do not provide high-quality habitat for bats; however, some of the alternative routes under consideration within the transmission cable envelope contain segments that would pass through undeveloped, vegetated areas comprised of upland forest and shrubland. The preferred transmission cable route is an approximate 1-mile (1.6-km) route that would predominantly follow along paved roads or previously disturbed areas such as parking lots. Based on Project timing, the limited area of effect relative to available habitat, and the proposed impact avoidance and minimization measures, adverse construction impacts of the Proposed Action on northern long-eared bat would be **negligible** adverse. O&M impacts resulting from vegetation clearing would be reduced by observing time-of-year restrictions on vegetation removal to avoid bats' breeding season and therefore, **negligible** adverse. Impacts from land disturbance during decommissioning would be similar to those described within the construction impact analysis, although the impacts would likely be less because new vegetation clearing and grading would not be necessary. Onshore construction and installation would add to other limited onshore bat habitat disturbance actions through the removal of approximately 1.6 acres (0.6 ha) of mixed oak/white pine forest at the ICF but would not result in population-level effects given the limited amount of habitat removal and the presence of high-quality habitat in the vicinity. Therefore, the cumulative impact of the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in short-term **negligible** to **minor** adverse impacts to bats.	**Onshore**: Alternatives C through F would not alter onshore activities. Therefore, construction, O&M, and decommissioning impacts would be the same as the Proposed Action: short term **negligible** adverse. Likewise, cumulative impacts would be the same as the Proposed Action: short term **negligible** to **minor** adverse impacts.				**Onshore**: Similar to Alternatives C through F, Alternative G would not alter onshore activities, and construction, O&M, and decommissioning impacts would be the same as the Proposed Action: short term **negligible** adverse. Likewise, cumulative impacts would be the same as the Proposed Action: short term **negligible** to **minor** adverse.
Light	Lighting sources on the WTGs and OSSs may serve as an attractant to bats as they navigate, or bats may be indirectly attracted to insect prey drawn to the lights. But based on collision mortalities	**Offshore**: Bats may demonstrate attraction to or avoidance of construction vessels installing offshore facilities. Exposure to vessels and installation infrastructure would be temporally limited to the construction period. Thus, behavioral	**Offshore**: No measurable change from Proposed Action construction impacts is anticipated for Alternatives C through F because the number and duration of construction vessels and work areas requiring nighttime lighting would be the same as described for the Proposed Action.				**Offshore**: Similar to Alternatives C through F, there is no measurable change from Proposed Action construction impacts anticipated for Alternative G, and impacts to bats from offshore lighting under this

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTGs	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
	documented at onshore wind farms, the behavioral vulnerability to collision due to offshore lighting for all bat species would be **negligible** adverse.	changes due to lighting on construction vessels would be temporary, and impacts to bats would be **negligible** adverse, with long-distance migratory bats most at risk because they are most likely to seasonally occur in the airspace of the RWF. Lighting during the O&M phase of the Project would be limited, which should reduce insect and potential bat attraction (Stantec 2018). Revolution Wind would comply with FAA (2018) and BOEM (2021c) requirements for lighting while using lighting technology (e.g., low-intensity strobe lights) that minimize impacts on bat species. Overall, collision-related mortality or injury from lighting at the offshore facilities could result in **negligible** to **minor** adverse impacts to bats at the RWF, with long-distance migratory bats most at risk because they are most likely to seasonally occur in the airspace of the RWF. The Proposed Action would add up to 100 new WTGs with red flashing aviation hazard lighting to the offshore environment. Vessel lights during construction and installation, O&M, and decommissioning would be minimal and limited to vessels transiting to and from construction areas. Ongoing and future non–offshore wind activities are expected to cause permanent impacts, primarily driven by light from offshore structures and short-term and localized impacts from vessel lights. For these reasons, the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in long-term **negligible** to **minor** adverse cumulative impacts to bats, with long-distance migratory bats most at risk because they are most likely to seasonally occur in the Lease Area.	Alternatives C through F would reduce operational nighttime lighting due to a reduced number of lighted structures, thereby negligibly decreasing the risk of bat injury or mortality from collision with WTGs. However, impacts to bats from offshore lighting under these alternatives would likely be the same as the Proposed Action: **negligible** to **minor** adverse. Alternatives C through F would add up to 56 to 93 new WTGs with red flashing aviation hazard lighting to the offshore environment. Additionally, marine navigation lighting would include one or more flashing white lights on each WTG and the OSSs and would be directed out and down to the water surface. Vessel lights during construction and installation, O&M, and decommissioning would be minimal and limited to vessels transiting to and from construction areas. These lights could serve as an attractant to bats as they navigate, or bats may be indirectly attracted to insect prey drawn to the lights. Ongoing and future non–offshore wind activities are expected to cause permanent impacts, primarily driven by light from offshore structures and short-term and localized impacts from vessel lights. For these reasons, Alternatives C through F, when combined with past, present, and reasonably foreseeable activities would result in long-term **negligible** to **minor** adverse cumulative impacts to bats, with long-distance migratory bats most at risk because they are most likely to seasonally occur in the Lease Area.				alternative would likely be the same as the Proposed Action: **negligible** to **minor** adverse. Alternative G would add 65 WTGs with red flashing aviation hazard lighting to the offshore environment. Additionally, marine navigation lighting would include one or more flashing white lights on each WTG and the OSSs and would be directed out and down to the water surface. Vessel lights during construction and installation, O&M, and decommissioning would be minimal and limited to vessels transiting to and from construction areas. These lights could serve as an attractant to bats as they navigate, or bats may be indirectly attracted to insect prey drawn to the lights. Ongoing and future non–offshore wind activities are expected to cause permanent impacts, primarily driven by light from offshore structures and short-term and localized impacts from vessel lights. For these reasons, Alternative G, when combined with past, present, and reasonably foreseeable activities would result in long-term **negligible** to **minor** adverse cumulative impacts to bats, with long-distance migratory bats most at risk because they are most likely to seasonally occur in the Lease Area.
		Onshore: Most construction activities would occur during the day over the approximately 1-year construction period for the onshore facilities, impacts from lighting on bats would be **negligible** adverse. During the O&M of the OnSS and ICF, general yard lighting would be used for assessment of equipment. In general, lighting would be off at night unless there is work in progress or lights are left on for safety and security purposes. Because the use of lighting at night is expected to be	**Onshore**: Alternatives C through F would not alter onshore activities. Therefore, impacts would be the same as the Proposed Action: temporary to short term **negligible** adverse.				**Onshore**: Similar to Alternatives C through F, Alternative G would not alter onshore activities, and impacts would be the same as the Proposed Action: temporary to short term **negligible** adverse.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTGs	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
		infrequent, the impacts it has on temporary bat displacement and/or behavior disruption would be **negligible** adverse. Lighting from construction and operations could add to baseline light sources and activities associated with other onshore projects. When considered in the context of the other nearby commercial and industrial lighting within the GAA, BOEM expects **negligible** adverse cumulative impacts to bats.					
Noise	Anthropogenic noise on the OCS associated with future offshore wind development, including noise from pile driving and construction activities (e.g., use of noise-producing heavy equipment or machinery), could impact bats on the OCS. Construction activity would be temporary to short term and highly localized; however, no auditory impacts on bats would be expected. Given the temporary and localized nature of potential impacts and bats' expected biologically insignificant response, impacts on bats are expected to be **negligible** adverse. No individual fitness (i.e., a bat's ability to survive and reproduce) or population-level impacts would occur as a result of onshore or offshore noise associated with future offshore wind development.	**Offshore**: Pile-driving noise and offshore construction noise associated with the Proposed Action would temporary to short term, and is expected to result in **negligible** adverse impacts. Increases in activity and associated disturbances during RWF maintenance activities would have a short-term **negligible** adverse impact on bats because of the limited additional vessel activity and relatively low likelihood of bat occurrence near the RWF. There would also be no impacts to bats during O&M of the offshore RWEC because these components are underwater, and there would be no routine maintenance at these components. Pile-driving and other construction noise and activity associated with the Proposed Action would add to baseline noise and activity associated with other offshore wind projects with overlapping construction periods. Therefore, the cumulative impact of the Proposed Action when combined with other past, present, and reasonably foreseeable projects would result in short-term **negligible** to **minor** adverse impacts to bats.	**Offshore**: Alternatives C through F would slightly decrease construction impacts on bats from noise associated with pile driving for WTGs as compared to the Proposed Action. Impacts, if any, would be temporary, limited to behavioral avoidance, and localized and would be the same as the Proposed Action: short term **negligible** adverse. No measurable change from Proposed Action O&M impacts is anticipated because operational noise sources and levels would be the same: short term **negligible** adverse. Pile-driving and other construction noise and activity associated with Alternatives C through F would add to baseline noise and activity associated with other offshore wind projects with overlapping construction periods. However, Alternatives C through F's contribution would be limited in duration and cease when construction ends. Therefore, these alternatives when combined with other past, present, and reasonably foreseeable projects would result in short- to long-term **negligible** to **minor** adverse cumulative impacts to bats.				**Offshore**: Similar to Alternatives C through F, Alternative G would slightly decrease construction impacts on bats from noise associated with pile driving for WTGs as compared to the Proposed Action, and impacts, if any, would be temporary, limited to behavioral avoidance, and localized and would be the same as the Proposed Action: short term **negligible** adverse. No measurable change from Proposed Action O&M impacts is anticipated because operational noise sources and levels would be the same: short term **negligible** adverse. Pile-driving and other construction noise and activity associated with Alternative G would add to baseline noise and activity associated with other offshore wind projects with overlapping construction periods. However, Alternative G's contribution would be limited in duration and cease when construction ends. Therefore, this alternative when combined with other past, present, and reasonably foreseeable projects would result in short- to long-term **negligible** to **minor** adverse cumulative impacts to bats.
		Onshore: Some potential for temporary to short-term, and localized habitat impacts arising from onshore construction noise exists; however, no auditory impacts on bats would be expected. Therefore, noise impacts resulting from construction and installation of the onshore facilities would be temporary **negligible** adverse. Most activities would generally not be conducted during the active bat foraging period between twilight and sunrise, thus noise from maintenance	**Onshore**: Alternatives C through F would not alter onshore activities. Therefore, impacts would be the same as the Proposed Action: temporary to long-term **negligible** adverse.				**Onshore**: Similar to Alternatives C through F, Alternative G would not alter onshore activities, and impacts would be the same as the Proposed Action: temporary to long term **negligible** adverse.

Impact-Producing Factor	**No Action Alternative**	**Alternative B (Proposed Action) up to 100 WTGs**	**Alternative C (Habitat Alternative) 64–65 WTGs**	**Alternative D (Transit Alternative) 78–93 WTGs**	**Alternative E (Viewshed Alternative) 64–81 WTGs**	**Alternative F (Higher Capacity Turbine Alternative) 56 WTGs**	**Alternative G (Preferred Alternative) 65 WTGs**
		activities is not expected to impact bat foraging behavior. Noise and traffic resulting from operation of the onshore facilities would be temporary and **negligible** adverse. Impacts to bats from noise during decommissioning would be similar to that described for construction activities. Construction noise and activities associated with construction and operation of the onshore facilities could add to baseline noise and activity associated with other onshore projects with overlapping construction periods. Normal operation of the OnSS would generate continuous noise, but BOEM expects long-term **negligible** adverse associated impacts when considered in the context of the other commercial and industrial noises nearby.					
Presence of structures	Some habitat conversion may result from port expansion activities required to meet the demands for fabrication, construction, transportation, and installation of wind energy structures. However, the noticeable increase from future offshore wind development would be a minimal contribution in the port expansion required to meet increased commercial, industrial, and recreational demand (BOEM 2019). Cave bats rarely occur offshore and given the rarity of tree bats in the offshore environment, the likelihood of exposure of cave and tree bats to construction vessels during construction or maintenance activities, or the RSZ of operating WTGs in the lease areas, is very low. Therefore, related impacts are expected to be **negligible** adverse.	**Offshore**: Exposure to vessels and installation infrastructure would be temporally limited to the construction period. Behavioral vulnerability to collision with construction equipment is expected to be **negligible** adverse. Collisions between bats and OSSs could cause injury and/or mortality. However, in general, these objects would not pose a collision risk because of a bat's ability to echolocate and detect stationary structures (Stantec 2018). Bat activity can be expected to be low during WTG operation and limited to warmer periods in the summer or during fall migration. Thus, the risk of injury and/or mortality to bats would be **negligible** to **minor** adverse. The structures associated with the Proposed Action, and the consequential **negligible** to **minor** adverse impacts, would remain at least until decommissioning of the Project is complete. The Project's contribution to impacts on bats would be limited because migrating bats rarely use the OCS and the Project would account for less than 4% of the total future structures on the OCS. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in long-term **negligible** to **minor** adverse cumulative impacts to bats.	**Offshore**: Alternatives C through F would reduce the number of WTGs, potentially resulting in a reduced amount of offshore construction equipment and vessels required. However, because bat exposure to vessels and installation infrastructure would be temporally limited to the construction period, the behavioral vulnerability to collision with construction equipment under Alternatives C through F is expected to be the same as described for the Proposed Action: short term **negligible** adverse. During operation, Alternatives C through F would reduce the number of WTGs as compared to the Proposed Action and potentially allow for improved maneuverability for bats through the Lease Area and negligibly decreases the risk of injury or mortality from collision with WTGs. However, impacts to bats from the presence of structures under these alternatives would not be substantially reduced and would likely be the same as the Proposed Action: long term **negligible** to **minor** adverse. Alternatives C through F would add 56 to 93, additional WTGs and up to two OSSs to the No Action Alternative. Therefore, the total cumulative structures would be 3,146 to 3,183. Impacts to migration patterns or collision risk from these additional turbines would persist until decommissioning is complete. However, the Project's contribution to impacts on bats would be limited because migrating bats rarely use the OCS and the Project would account for less than 4% of the total future structures on the OCS. Therefore, these alternatives, when combined with past, present, and reasonably foreseeable projects would result in long-term **negligible** to **minor** adverse cumulative impacts to bats.				**Offshore**: Similar to Alternatives C through F, construction impacts for Alternative G would be expected to be the same as described for the Proposed Action: short term **negligible** adverse. During operation, similar to Alternatives C through F, Alternative G impacts to bats from the presence of structures would likely be the same as the Proposed Action: long term **negligible** to **minor** adverse. Alternative G would add 65 WTGs and up to two OSSs to the No Action Alternative. Therefore, the total cumulative structures would be 3,155. Impacts to migration patterns or collision risk from these additional turbines would persist until decommissioning is complete. However, the Project's contribution to impacts on bats would be limited because migrating bats rarely use the OCS and the Project would account for less than 3% of the total future structures on the OCS. Therefore, this alternative when combined with past, present, and reasonably foreseeable projects would result in long-term **negligible** to **minor** adverse cumulative impacts to bats.
		Onshore: Impacts on mortality and injury from the onshore construction operations would be avoided by observing time-of-year restrictions on vegetation removal that would avoid the breeding season of bats (see Appendix F, Table F-2).	**Onshore**: Alternatives C through F would not alter onshore activities. Therefore, impacts would be the same as the Proposed Action: temporary to long-term **negligible** adverse.				**Onshore**: Similar to Alternatives C through F, Alternative G would not alter onshore activities, and impacts would be the same as

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTGs	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
		Therefore, these temporary impacts, if any, from construction equipment and ongoing activity would be **negligible** adverse. The OnSS and ICF would be visible structures that would result in permanent bat habitat conversion and loss. Land disturbance as it relates to vegetation clearing may result in the direct injury or mortality of bats. However, mortality and injury risk would be reduced by observing time-of-year restrictions on vegetation removal to avoid bats' breeding season. Collisions between bats and onshore facilities could cause mortality. However, in general, these objects would likely not pose a collision risk because of a bat's ability to echolocate and detect stationary structures (Stantec 2018). Therefore, the impacts to bats from the presence of onshore facilities would be long term **negligible** adverse**.** The contribution of the Proposed Action to cumulative impacts would not result in population-level effects given the limited amount of habitat removal and the presence of high-quality habitat in the vicinity. The combined impacts on bats from habitat loss would likely be long term **negligible** adverse given the limited amount of habitat removal and the presence of high-quality habitat in the vicinity.					the Proposed Action: temporary to long term **negligible** adverse.

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3.5.2.2 Alternative A: Impacts of the No Action Alternative on Bats

3.5.2.2.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for bats (see Section 3.5.1) would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities and by permitted and constructed offshore wind COP projects within the GAA for bats. These IPFs are described and analyzed in Appendix E1.

3.5.2.2.2 Cumulative Impacts

This section discloses potential bat impacts associated with future offshore wind development (without the Proposed Action). The cumulative impact analysis for the No Action Alternative for planned non–offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E1.

<u>Cable emplacement/maintenance:</u> A small amount of infrequent construction impacts associated with onshore power infrastructure would be required over the next 6 to 10 years to tie future offshore wind energy projects to the electric grid. Typically, this would require only small amounts of habitat removal, if any, and would occur in previously disturbed areas. Temporary to short-term impacts associated with habitat loss or avoidance during cable emplacement/maintenance may occur, but no injury or mortality of bat individuals would be expected. Cable emplacement/maintenance is therefore expected to have **negligible** adverse impacts on bats.

<u>Light:</u> Lighting sources on the WTGs and OSSs may serve as an attractant to bats as they navigate, or bats may be indirectly attracted to insect prey drawn to the lights. The lack of bat carcasses reported during large-scale bird-related fatality events at illuminated lighthouses, lightships, and oil or research platforms indicates that bats do not appear to be as susceptible to these types of collision risks as some birds (Stantec 2018). The wind turbines would be lit with aviation lighting, although the duration of lighting would be minimized by an automatic detection lighting system (ADLS) (see Table F-2 in Appendix F for details). Aviation lighting has not been found to influence bat collision risk at onshore facilities in North America (Arnett et al. 2008). Based on collision mortalities documented at onshore wind farms, the behavioral vulnerability to collision due to offshore lighting for all bat species would be **negligible** adverse.

<u>Noise:</u> Anthropogenic noise on the OCS associated with future offshore wind development, including noise from pile-driving and construction activities (e.g., use of noise-producing heavy equipment or machinery), could impact bats on the OCS. Noise from pile driving would occur during installation of foundations for offshore structures at a frequency of 4 to 6 hours at a time over 6 to 10 years. Construction activity would be temporary to short term, and highly localized. Further, the majority of these activities would take place during the day while bats are in torpor. A study evaluated the effect of noise on torpid bats and found that bats responded most strongly to colony and vegetation noise and most weakly to traffic noise (Luo et al. 2014). The study also documented evidence that torpid bats can rapidly habituate to repeated and prolonged noise disturbance, suggesting that traffic noise is less disturbing to torpid bats than colony or vegetation noise (Luo et al. 2014). Another study found that bats avoided foraging areas subjected to strong noise impacts (Schaub et al. 2008). This study suggests that foraging areas close to highways and other sources of intense broadband noises are degraded in their suitability as

foraging areas for "passive listening" bats (Schaub et al. 2008). Because most construction activities would generally not be conducted during the active bat foraging period between twilight and sunrise, most noise generated from construction activities is not expected to impact bat foraging behavior. Luo et al. (2014) demonstrated that bat response to traffic noise was low relative to other stimuli (e.g., colony noise, vegetation) and that bats rapidly habituate to prolonged noise disturbance. Auditory impacts are not expected to occur because recent research shows that bats may be less sensitive to temporary threshold shifts than other terrestrial mammals (Simmons et al. 2016). Construction activities could generate noise sufficient to cause avoidance behavior by individual migrating tree bats (Schaub et al. 2008), thus potentially causing habitat-related impacts (i.e., displacement). These impacts would likely be limited to behavioral avoidance of pile-driving and/or construction activities (e.g., use of noise-producing heavy equipment or machinery), and no temporary or permanent hearing loss would be expected (Simmons et al. 2016). However, these impacts are unlikely because little use of the OCS is expected by bats, and only during spring and fall migrations. Therefore, based on available information, noise impacts resulting from construction of offshore facilities would be temporary **negligible** adverse.

Some potential for temporary to short-term and localized habitat impacts arising from onshore construction noise exists; however, no auditory impacts on bats would be expected. As discussed with offshore construction noise, recent literature suggests that bats are less susceptible to temporary or permanent hearing loss from exposure to intense sounds (Simmons et al. 2016). Impacts would be limited to individuals roosting adjacent to onshore construction locations. Nighttime work may be required on an as-needed basis, which could impact foraging bats. Some temporary displacement and/or avoidance of potentially suitable foraging habitat could occur, but these impacts would not be biologically significant. Some bats roosting near construction activities may be disturbed during construction, but they would move to a different roost farther from construction noise. This would not result in any impacts because frequent roost switching is common among bats (Hann et al. 2017; Whitaker 1998). Based on available information, noise impacts resulting from construction of the onshore facilities would be temporary **negligible** adverse.

Nonroutine activities associated with offshore wind facilities would generally require intense temporary activity to address emergency conditions. The noise made by onshore construction equipment or offshore repair vessels could temporarily deter bats from approaching the site of a given nonroutine event. Impacts on bats, if any, would be temporary and last only as long as repair or remediation activities were necessary to address these nonroutine events.

Given the temporary and localized nature of potential impacts and bats' expected biologically insignificant response, impacts on bats are expected to be **negligible** adverse. No individual fitness (i.e., a bat's ability to survive and reproduce) or population-level impacts would occur as a result of onshore or offshore noise associated with future offshore wind development.

<u>Presence of structures:</u> In addition to electrical infrastructure, some habitat conversion may result from port expansion activities required to meet the demands for fabrication, construction, transportation, and installation of wind energy structures. The general trend along the coastal region from Virginia to Maine is that port activity will increase modestly and require some conversion of undeveloped land to meet port demand and will result in permanent habitat loss for local bat populations. However, the noticeable increase from future offshore wind development would be a minimal contribution in the port expansion required to meet increased commercial, industrial, and recreational demand (BOEM 2019). The current

bearing capacity of existing ports is considered suitable for wind turbines, requiring no port modifications for supporting offshore wind energy development (U.S. Department of Energy [2014]).

Using the assumptions in Table E-4 in Appendix E, the cumulative offshore wind activities scenario would include up to 3,025 WTGs on the OCS that could result in potential impacts on bats. Cave bats (including the federally threatened northern long-eared bat and the state-endangered eastern small-footed bat, little brown bat, and tri-colored bat) rarely occur offshore (even during fall migration) and, therefore, exposure to construction vessels during construction or maintenance activities, or the rotor swept zone (RSZ) of operating WTGs in the lease areas, is expected to be **negligible** adverse, if exposure occurs at all (Pelletier et al. 2013).

Tree bats, however, may pass through offshore WEAs on the OCS during the fall migration, with limited potential for migrating bats to encounter vessels during construction and decommissioning of WTGs, electric service platforms, and offshore export cable corridors, although structure and vessel lights may attract bats because of the increased prey abundance. As discussed above, although bats have been documented at offshore islands, relatively little bat activity has been documented in open water habitat similar to the conditions in the WEAs (Stantec 2018, 2020). Several studies, such as Cryan and Barclay (2009), Cryan et al. (2014), and Kunz et al. (2007), discuss several hypotheses as to why bats may be attracted to WTGs. Many of these, including the creation of linear corridors, altered habitat conditions, or thermal inversions, would not apply to WTGs on the Atlantic OCS (Cryan and Barclay 2009; Cryan et al. 2014; Kunz et al. 2007). Other hypotheses associated with the Atlantic OCS regarding bat attraction to WTGs include bats perceiving the WTGs as potential roosts, potentially increased prey base, visual attraction, disorientation due to electromagnetic fields or decompression, or attraction due to mating strategies (Arnett et al. 2008; Cryan et al. 2007; Kunz et al. 2007). However, no definitive answer as to why, if at all, bats are attracted to WTGs has been postulated, despite intensive studies at onshore wind facilities. For this reason, some bats may encounter, or perhaps be attracted to, the expected structures (i.e., electric service platforms and non-operational WTG towers) to opportunistically roost or forage. However, bats' echolocation abilities and agility make it unlikely that these stationary objects (i.e., electric service platforms and non-operational WTGs) or moving vessels would pose a collision risk to migrating individuals. This assumption is supported by the evidence that bat carcasses are rarely found at the base of onshore turbine towers (Choi et al. 2020).

Tree bat species that may encounter operating WTGs in the offshore lease areas include the eastern red bat, the hoary bat, and the silver-haired bat. Offshore O&M would present a seasonal risk factor to migratory tree bats that may use offshore habitats during fall migration. Although some potential exists for migrating tree bats to encounter operating WTGs during fall migration, the overall occurrence of bats on the OCS is relatively very low (Stantec 2016). With the proposed 1-nm (1.9-km) spacing between structures associated with future offshore wind development and the distribution of anticipated projects, individual bats migrating over the OCS within the RSZ of project WTGs would likely pass through projects with only slight course corrections, if any, to avoid operating WTGs. Further, unlike terrestrial migration routes there are no landscape features that would concentrate bats and increase exposure to the WEAs on the OCS (Baerwald and Barclay 2009; Cryan and Barclay 2009; Fiedler 2004; Hamilton 2012; Smith and McWilliams 2016). This combined with the expected infrequent and limited use of the OCS by migrating tree bats suggests very few individuals would encounter operating WTGs or other structures associated with future offshore wind development. Additionally, the potential collision risk to migrating tree bats varies with climatic conditions. For example, bat activity is associated with relatively low wind speeds and warm temperatures (Arnett et al. 2008; Cryan and Brown 2007; Fiedler 2004; Kerns et al. 2005). Given the rarity of tree bats in the offshore environment, the turbines being widely spaced apart, and the patchiness of expected projects on the OCS, the likelihood of collisions is expected to be low. Additionally, the likelihood of a migrating individual encountering one or more operating WTGs during adverse weather conditions is extremely low because bats have been shown to suppress activity during periods of strong winds, low temperatures, and rain (Arnett et al. 2008; Erickson et al. 2002).

For these reasons, the likelihood of exposure of tree bats to construction vessels during construction or maintenance activities, or the RSZ of operating WTGs in the lease areas, is very low, and therefore related impacts are expected to be **negligible** adverse.

3.5.2.2.3 Conclusions

Under the No Action Alternative, the Project would not be built. Impacts from ongoing future non–offshore and offshore wind development activities would still occur. BOEM expects ongoing activities, future non–offshore wind development, and future offshore wind development to have continuing temporary to permanent impacts (e.g., disturbance, displacement, injury, mortality, and habitat conversion) on bats primarily through the onshore construction impacts, the presence of structures, and climate change. BOEM anticipates that the potential impacts of ongoing activities would be **negligible** adverse. In addition to ongoing activities, BOEM anticipates that the impacts of planned actions other than offshore wind development may also contribute to impacts on bats, including increasing onshore construction (see Appendix E1), but that these impacts would be **negligible** adverse. BOEM expects the combination of ongoing and planned actions other than offshore wind development to result in **negligible** adverse impacts on bats. Although the impacts from a substitute project may differ in location and time, depending on where and when offshore wind facilities are developed to meet the remaining demand, the nature of impacts and the total number of WTGs would be similar either with or without the Proposed Action. The No Action Alternative would forgo applicant-committed postconstruction acoustic monitoring for bats and annual mortality reporting. Their results could provide an understanding of the effects of offshore wind development, benefit the future management of these species, and inform planning of other offshore development. However, ongoing and future surveys and monitoring could still supply similar data.

Considering all the IPFs together, BOEM anticipates that the overall impacts associated with future offshore wind activities in the GAA would result in **negligible** adverse impacts from ongoing climate change, lighting, interactions with operating WTGs on the OCS, and onshore habitat loss. Given the infrequent and limited anticipated use of the OCS by migrating tree bats during spring and fall migration, as well as cave bats not typically occurring on the OCS, the IPFs associated with future offshore wind activities that occur offshore would not appreciably contribute to overall impacts on bats. Future offshore wind development could result in some potential for temporary disturbance and permanent loss of onshore bat habitat. However, habitat removal is anticipated to be minimal when compared to other past, present, and reasonably foreseeable activities. Any impacts resulting from habitat loss or disturbance would not be expected to result in individual fitness or population-level effects within the GAA.

3.5.2.3 Alternative B: Impacts of the Proposed Action Alternative on Bats

3.5.2.3.1 Construction and Installation

Offshore Activities and Facilities

Light: Bats may demonstrate attraction to or avoidance of construction vessels installing offshore facilities, particularly if insects (i.e., prey) are drawn to the lights of the vessels (BOEM 2014). Exposure to vessels and installation infrastructure would be temporally limited to the construction period. Thus, behavioral changes due to lighting on construction vessels would be temporary, and impacts to bats would be **negligible** adverse, with long-distance migratory bats most at risk because they are most likely to seasonally occur in the airspace of the RWF.

Noise: Pile-driving noise and offshore construction noise associated with the Proposed Action would be temporary to short term and highly localized and is expected to result in **negligible** adverse impacts. Auditory impacts are not expected to occur as recent research shows that bats may be less sensitive to temporary threshold shifts than other terrestrial mammals (Simmons et al. 2016). Impacts, if any, would be limited to behavioral avoidance of pile-driving and/or construction activities, and no temporary or permanent hearing loss would be expected (Simmons et al. 2016).

Presence of structures: Bats are expected to seasonally occur in the Lease Area while migrating, commuting, or foraging. Bats were observed roosting aboard support vessels during the construction of the Block Island Wind Farm (Stantec 2016), suggesting the presence of artificial roosting structures may provide some benefit to bats in the offshore environment. Bats are well known for their ability to detect objects with echolocation (Horn et al. 2008; Johnson et al. 2004) and thus are unlikely to collide with stationary structures (Cryan 2011). Further, exposure to vessels and installation infrastructure would be temporally limited to the construction period. Behavioral vulnerability to collision with construction equipment is expected to be **negligible** adverse.

Onshore Activities and Facilities

Cable emplacement/maintenance: The preferred transmission cable route is an approximately 1-mile (1.6-km) route, that would predominantly follow along paved roads or previously disturbed areas such as parking lots that do not provide high-quality habitat for bats. However, some of the alternative routes under consideration within the transmission cable envelope contain segments that would pass through undeveloped, vegetated areas composed of upland forest and shrubland and would be approximately the same length (see Section 3.8). Impacts associated with construction of the onshore transmission cable could occur if construction activities take place during the active season for bats (generally April through October). Such activities may result in injury or mortality of individual bats, particularly juveniles as they are unable to flush from a roost if occupied by bats at the time of removal. However, tree and shrub removal would occur outside the bat roosting period (from May 1 through August 15) when feasible (see COP Table ES-1), thus limiting the potential for direct injury or mortality from the removal of occupied roost trees. There would be some potential for adverse impacts on bats as a result of the loss of potentially suitable roosting and/or foraging habitat, but these impacts would be **negligible** adverse.

BOEM anticipates that **negligible** adverse impacts, if any, would occur with adherence to USFWS northern long-eared bat conservation measures and that **negligible** adverse habitat impacts would not result in individual fitness or population-level effects given the limited amount of habitat removal and the presence of high-quality bat habitat in the vicinity. Based on Project timing, the limited area of effect relative to available habitat, and the proposed impact avoidance and minimization measures, adverse impacts of the Proposed Action on northern long-eared bat would be **negligible** adverse. A detailed impacts analysis to northern long-eared bats from Project construction activities is provided in the USFWS BA (BOEM 2022, 2023).

Light: Some overnight lighting would occur during construction of the onshore facilities. Wildlife typically not exposed to light, such as bats, may behave differently if exposed to light at nighttime. Because most construction activities would occur during the day over the approximately 1-year construction period for the onshore facilities, impacts from lighting on bats would be **negligible** adverse.

Noise: Some potential for temporary to short term and localized habitat impacts arising from onshore construction noise exists; however, no auditory impacts on bats would be expected. As discussed with offshore construction noise, recent literature suggests that bats are less susceptible to temporary or permanent hearing loss from exposure to intense sounds (Simmons et al. 2016). Based on available information discussed in Section 3.5.1.1, noise impacts resulting from construction and installation of the onshore facilities would be temporary **negligible** adverse.

Presence of structures: Visible structures (i.e., construction equipment) would be present during construction of the onshore facilities. Collisions between bats and vehicles or construction equipment could cause injury and/or mortality. However, in general, these objects would not pose a collision risk because of a bat's ability to echolocate and detect stationary structures (Stantec 2018). The operational footprints of the OnSS and ICF would result in habitat loss when forested upland is cleared and replaced with hard structures and crushed gravel yards. The ICF would result in a loss of approximately 1.6 acres (0.6 ha) of mixed oak/white pine forest, which is reflective of the operational footprint of the ICF. The OnSS would create a loss of 3.8 acres (1.5 ha) of mixed oak/white pine forest and 0.6 acre (0.2 ha) of ruderal pitch pine barren. Together, these losses represent a relatively small fraction of the 52 acres (21 ha) of contiguous bat habitat identified in the *Rhode Island Wildlife Action Plan* (RIWAP) (Rhode Island DEM et al. 2015). Impacts on mortality and injury from the onshore construction operations would be avoided by observing time-of-year restrictions on vegetation removal that would avoid the breeding season of bats (see COP Table ES-1). Therefore, these temporary impacts, if any, from construction equipment and ongoing activity would be **negligible** adverse.

3.5.2.3.2 Operations and Maintenance and Decommissioning

Offshore Activities and Facilities

Light: Lighting sources on the WTGs and OSSs may serve as an attractant to bats as they navigate, or bats may be indirectly attracted to insect prey drawn to the lights. However, bats do not appear to be as susceptible to these types of collision risks as some birds (Stantec 2018), and aviation lighting has not been found to influence bat collision risk at onshore facilities in North America (Arnett et al. 2008). Lighting during the O&M phase of the Project would be limited, which should reduce insect and potential bat attraction (Stantec 2018). Revolution Wind would comply with FAA (2018) and BOEM (2021c) requirements for lighting while using lighting technology (e.g., low-intensity strobe lights) that minimize impacts on bat species. Overall, collision-related mortality or injury from lighting at the offshore facilities could result in **negligible** to **minor** adverse impacts to bats at the RWF, with long-distance migratory bats most at risk because they are most likely to seasonally occur in the airspace of the RWF.

Noise: Boat activity and noise already occur within and adjacent to the Lease Area based on existing levels of vessel traffic, as described in Section 3.16. Increases in activity and associated disturbances during RWF maintenance activities would have a short-term **negligible** adverse impact on bats because of the limited additional vessel activity and relatively low likelihood of bat occurrence near the RWF. There would also be no impacts to bats during O&M of the offshore RWEC because these components are underwater, and there would be no routine maintenance at these components.

Presence of structures: During Project O&M, injury or mortality from collision with WTGs represents the greatest potential risk to bats. WTGs and other offshore facilities may also provide roosting opportunities for bats. Collisions between bats and OSSs could cause injury and/or mortality. However, in general, these objects would not pose a collision risk because of a bat's ability to echolocate and detect stationary structures (Stantec 2018). Additionally, individual bats could collide with WTGs, resulting in mortality or injury. It is difficult to confirm bat fatalities at offshore WTGs; however, offshore bat occurrences are relatively infrequent and primarily seasonal (during migration), and activity declines as the distance from shore increases. Existing data from meteorological buoys provide the best opportunity to further define bat use of open-water habitat far from shore where Project WTGs are proposed. Relatively few bat passes were detected at meteorological buoy sites, and use was sporadic when compared to sites on offshore islands (Stantec 2016). In general, the bat species assessed are not expected to regularly forage in the Lease Area, but some may be present during migration, particularly in the fall (BOEM 2012; Stantec 2018).

Specific weather conditions may contribute to bat mortality from turbines. Mortality data from onshore wind farms indicate that bat collision mortality is expected to occur mainly on nights with calm winds during migratory periods as relatively more bats are migrating at greater altitudes in favorable conditions (Arnett et al. 2008). Likewise, coastal and offshore acoustic studies (Stantec 2016) found that greater wind speeds and cool temperatures have an adverse effect on bat activity. However, during fall migration, bats may take advantage of favorable wind directions and may be more likely to fly during colder weather (Stantec 2016). Most offshore bat activity took place at wind speeds less than 5 m/s. Because average wind speeds in the Lease Area are between 5 and 10 m/s, with stronger wind in the winter, bat activity can be expected to be low during WTG operation and limited to warmer periods in the summer or during fall migration. Thus, the risk of injury and/or mortality to bats would be **negligible** to **minor** adverse. The structures associated with the Proposed Action, and the consequential **negligible** to **minor** adverse impacts, would remain at least until decommissioning of the Project is complete. Impacts from O&M of the RWF to the listed northern long-eared bat are not expected because of their low collision risk and the rarity of their occurrence offshore. A detailed impacts analysis to northern long-eared bats from Project operation and decommissioning is provided in the USFWS BA (BOEM 2022, 2023).

Onshore Activities and Facilities

Cable emplacement/maintenance: Hazard tree removal would be performed on a cyclical basis to inspect and remove trees that may fall that are outside the edge of the maintained ROW. However, mortality and injury risk would be reduced by observing time-of-year restrictions on vegetation removal to avoid bats' breeding season. Therefore, the impacts resulting from vegetation clearing would be **negligible** adverse. Impacts from land disturbance during decommissioning would be similar to those described within the construction impact analysis, although the impacts would likely be less because new vegetation clearing and grading would not be necessary.

Light: During the O&M of the OnSS and ICF, general yard lighting would be used for assessment of equipment. In general, lighting would be off at night unless there is work in progress or lights are left on for safety and security purposes. Insect prey could be drawn in by lighting at the OnSS and ICF and thus attract foraging bats. However, the surrounding area is currently developed, and lighting-related effects would be abated using minimum-intensity and motion-activated lighting and shielding and downward angling light sources where practicable. As during construction of the onshore facilities, lighting at night has the potential to temporarily displace bats and/or disrupt normal behavior. Because the use of lighting at night is expected to be infrequent, the impacts it has on temporary bat displacement and/or behavior disruption would be **negligible** adverse.

Noise: According to VHB's onshore acoustic assessment (VHB 2023a), during O&M, the proposed OnSS and ICF would introduce new sources of sound, which are modeled to be 45.5 A-weighted decibels (dBA) equivalent sound level (Leq) or less when measured at the nearest anthropogenic sensitive receptors and fall within the ambient sound range measured at baseline conditions. Temporary noise and construction-related traffic may occasionally be generated due to nonroutine maintenance. Pickup trucks may be used to make routine visits to the OnSS and ICF during O&M. Occasional O&M emergency visits may necessitate bucket trucks, cranes, and similar vehicles. Infrequent vehicle usage within the OnSS and ICF may create temporary noise-related disturbance to bats adjacent to the OnSS. However, most activities would generally not be conducted during the active bat foraging period between twilight and sunrise, thus noise from maintenance activities is not expected to impact bat foraging behavior. Luo et al. (2014) demonstrated that bat response to traffic noise was low relative to other stimuli (e.g., colony noise, vegetation) and that bats rapidly habituate to prolonged noise disturbance. Based on this available information, noise and traffic resulting from operation of the onshore facilities would be temporary and **negligible** adverse. Impacts to bats from noise during decommissioning would be similar to that described for construction activities.

Presence of structures: The OnSS and ICF would be visible structures that would result in permanent bat habitat conversion and loss. Land disturbance in the form of vegetation management would occur on a periodic basis to maintain vegetation at shrub height within the operational footprint of the onshore facilities. Land disturbance as it relates to vegetation clearing may result in the direct injury or mortality of bats. However, mortality and injury risk would be reduced by observing time-of-year restrictions on vegetation removal to avoid bats' breeding season. Collisions between bats and onshore facilities could cause mortality. However, in general, these objects would likely not pose a collision risk because of a bat's ability to echolocate and detect stationary structures (Stantec 2018). Therefore, the impacts to bats from the presence of onshore facilities would be long term **negligible** adverse**.**

3.5.2.3.3 Cumulative Impacts

Offshore Activities and Facilities

Lighting: The Proposed Action would add up to 100 new WTGs with red flashing aviation hazard lighting to the offshore environment. Additionally, marine navigation lighting would include multiple flashing white lights on each WTG and the OSSs and would be directed out and down to the water surface. Vessel lights during construction and installation, O&M, and decommissioning would be minimal and limited to vessels transiting to and from construction areas. These lights could serve as an attractant to bats as they navigate, or bats may be indirectly attracted to insect prey drawn to the lights.

However, the lack of bat carcasses reported during large-scale bird-related fatality events at illuminated lighthouses, lightships, and oil or research platforms indicates that bats do not appear to be as susceptible to these types of collision risks as some birds (Stantec 2018). As such, ongoing and future non–offshore wind activities are expected to cause permanent impacts, primarily driven by light from offshore structures and short-term and localized impacts from vessel lights. For these reasons, the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in long-term **negligible** to **minor** adverse cumulative impacts to bats, with long-distance migratory bats most at risk because they are most likely to seasonally occur in the Lease Area.

Noise: Pile-driving and other construction noise and activity associated with the Proposed Action would add to baseline noise and activity associated with other offshore wind projects with overlapping construction periods. However, the Proposed Action's contribution to noise impacts would be limited in duration and cease when construction ends. Therefore, the cumulative impact of the Proposed Action when combined with other past, present, and reasonably foreseeable projects would result in short-term **negligible** to **minor** adverse impacts to bats.

Presence of structures: The Proposed Action would add up to 100 additional WTGs and up to two OSSs to the No Action Alternative. Therefore, the total cumulative structures would be 3,190. Impacts to migration patterns or collision risk from these additional turbines would persist until decommissioning is complete. However, the Project's contribution to impacts on bats would be limited because migrating bats rarely use the OCS and the Project would account for less than 4% of the total future structures on the OCS. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in long-term **negligible** to **minor** adverse cumulative impacts to bats.

Onshore Activities and Facilities

Cable emplacement/maintenance: The transmission cable envelope contains approximately 0.56 acre (0.22 ha) of mixed oak/white pine forest, 0.32 acre of softwood forest, 0.02 acre of ruderal grassland/shrubland, 0.008 acre of oak forest, and 0.006 acre of pitch pine barren (see Section 3.8). Onshore construction and installation would add to other limited onshore bat habitat disturbance actions. Land disturbance associated with cable emplacement could result in the loss of potentially suitable roosting and/or foraging habitat for bats. However, the preferred transmission cable route is an approximate 1-mile (1.6-km) route that would predominantly follow along paved roads or previously disturbed areas such as parking lots. Further, Revolution Wind and other future land developers would adhere to USFWS northern long-eared bat conservation measures. As a result, cumulative impacts would not result in population-level effects given the limited amount of habitat removal and the presence of high-quality habitat in the vicinity. Therefore, the cumulative impact of the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in short-term **negligible** to **minor** adverse impacts to bats.

Light: The Proposed Action would involve the use of some overnight lighting during construction and installation and during O&M and decommissioning of the onshore facilities. O&M lighting of facilities would be switch activated and would only occur when O&M activities are ongoing. Lighting from construction and operations could add to baseline light sources and activities associated with other onshore projects. Because the use of lighting at night is expected to be infrequent, the impacts it has on temporary bat displacement and/or behavior would be short term **negligible** adverse. When considered in the context of the other nearby commercial and industrial lighting within the GAA, BOEM expects **negligible** adverse cumulative impacts to bats.

<u>Noise:</u> Construction noise and activities associated with construction and operation of the onshore facilities could add to baseline noise and activity associated with other onshore projects with overlapping construction periods. However, the Proposed Action's incremental contribution would be **negligible** adverse as it would be limited in duration and cease when construction ends. No individual fitness or population-level effects would be expected. Normal operation of the OnSS would generate continuous noise, but BOEM expects long-term **negligible** adverse associated impacts when considered in the context of the other commercial and industrial noises nearby.

<u>Presence of structures:</u> Onshore construction and installation would add to other limited onshore bat habitat disturbance actions through the removal of approximately 1.6 acres (0.6 ha) of mixed oak/white pine forest at the ICF. The OnSS would create a loss of 3.8 acres (1.5 ha) of mixed oak/white pine forest. This land disturbance could result in the loss of potentially suitable roosting and/or foraging habitat for bats. However, Revolution Wind and other future land developers would adhere to USFWS northern long-eared bat conservation measures, which would also minimize impacts to other roosting/foraging bat species. As a result, the contribution of the Proposed Action to cumulative impacts would not result in population-level effects given the limited amount of habitat removal and the presence of high-quality habitat in the vicinity. The combined impacts on bats from habitat loss would likely be long term **negligible** adverse given the limited amount of habitat removal and the presence of high-quality habitat in the vicinity. Collisions between bats and structures have some limited potential to cause mortality. However, in general, these objects would not pose a collision risk because of a bat's ability to echolocate and detect stationary structures and therefore would not contribute to cumulative impacts to bats.

3.5.2.3.4 Conclusions

In summary, construction and installation, O&M, and decommissioning of the Proposed Action would have **negligible** to **minor** adverse impacts on bats, especially if conducted outside the active season. The main significant risk would be from operation of the offshore WTGs, which could lead to long-term **negligible to minor** adverse impacts in the form of collision-related mortality, although BOEM anticipates this to be rare. In the context of reasonably foreseeable environmental trends in the area, impacts of individual IPFs resulting from ongoing and planned actions, including the Proposed Action, would be **negligible** to **minor** adverse. Considering all the IPFs together, BOEM anticipates that the impacts from ongoing and planned actions, including the Proposed Action, would result in **negligible** to **minor** adverse impacts on bats in the GAA because of ongoing climate change, interactions with operating WTGs on the OCS, and onshore habitat loss. Future offshore wind activities are not expected to materially contribute to the IPFs discussed above. Given the infrequent and limited anticipated use of the OCS by migrating tree bats during spring and fall migration and that cave bats do not typically occur on the OCS, the IPFs associated with future offshore wind activities that occur offshore would not be expected to appreciably contribute to overall impacts on bats. Some potential for temporary disturbance and permanent loss of onshore habitat may occur as a result of future offshore wind development. However, habitat removal is anticipated to be minimal, and any impacts resulting from habitat loss or disturbance would not be expected to result in individual fitness or population-level effects within the GAA. The Proposed Action would contribute to the overall impact rating primarily through the permanent impacts due to onshore habitat loss. Thus, the overall impacts on bats would be **minor** adverse because limited impacts are expected due to the minimal presence of bats within the Lease Area and bat populations would recover completely.

3.5.2.4 Alternatives C, D, E, and F

Table 3.5-1 provides a summary of IPF findings for these alternatives.

3.5.2.4.1 Conclusions

Alternatives C through F would reduce the number of WTGs, which subsequentially would reduce the potential collision risk for bats. Still, BOEM expects the overall impacts of these alternatives to bats would be similar to the Proposed Action: **negligible** to **minor** adverse.

In the context of other reasonably foreseeable environmental trends and planned actions, BOEM also expects that Alternatives C through F's contribution to the cumulative impacts would be similar to the Proposed Action (ranging from **negligible** to **minor** adverse, depending on the IPF). The overall impacts of Alternatives C through F when combined with past, present, and reasonably foreseeable activities would therefore be the same as under the Proposed Action: **minor** adverse.

3.5.2.5 Alternative G: Impacts of the Preferred Alternative on Bats

Table 3.5-1 provides a summary of IPF findings for this alternative.

3.5.2.5.1 Conclusions

Although Alternative G would reduce the number of WTGs, the presence of WTGs could still increase the potential for collision, albeit at lower levels than the Proposed Action. Still, BOEM expects the overall impacts of these alternatives to bats would be similar to the Proposed Action: **negligible** to **minor** adverse.

In the context of other reasonably foreseeable environmental trends and planned actions, BOEM also expects that Alternative G's contribution to cumulative impacts would be similar to the Proposed Action (ranging from **negligible** to **minor** adverse, depending on the IPF). The overall impacts of Alternative G when combined with past, present, and reasonably foreseeable activities would therefore be the same as under the Proposed Action: **minor** adverse.

3.5.2.6 Mitigation

Mitigation measures resulting from agency consultations for bats are identified in Appendix F, Table F-2, and addressed in Table 3.5-2. Draft conservation recommendations proposed to BOEM by the USFWS on May 22, 2023, are identified in Appendix F, Table F-3, and addressed in Table 3.5-3.

Table 3.5-2. Mitigation and Monitoring Measures Resulting from Consultations for Bats (Appendix F, Table F-2)

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
Annual bird and bat mortality reporting	Revolution Wind must submit an annual report covering each calendar year, due by January 31 of the following year, documenting any dead (or injured) birds or bats found on vessels and structures during construction, operations, and decommissioning. The report must be submitted to BOEM (at renewable_reporting@boem.gov), BSEE (at OSWSubmittals@bsee.gov), and the USFWS. The report must contain the following information: 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 USGS Bird Banding Laboratory at https://www.usgs.gov/labs/bird-banding-laboratory.	This measure would not reduce impacts; however, the data gathered from the mortality reporting would be used to evaluate impacts and potentially lead to additional mitigation measures, if required (30 CFR 585.633(b)).
Annual bird and bat mortality reporting	Any occurrence of dead ESA birds or bats must be reported to BOEM, BSEE, and USFWS as soon as practicable (taking into account crew and vessel safety), but no later than 24 hours after the sighting, and if practicable, carefully collect the dead specimen and preserve the material in the best possible state.	This measure would not reduce impacts; however, the data gathered from the monitoring would be used to evaluate impacts and potentially lead to additional mitigation measures, if required (30 CFR 585.633(b)).
Annual bird and bat mortality reporting	Any occurrence of dead ESA birds or bats must be reported to BOEM, BSEE, and USFWS as soon as practicable (taking into account crew and vessel safety), but no later than 24 hours after the sighting, and if practicable, carefully collect the dead specimen and preserve the material in the best possible state.	This measure would not reduce impacts; however, the data gathered from the monitoring would be used to evaluate impacts and potentially lead to additional mitigation measures, if required (30 CFR 585.633(b)).
Avian and bat monitoring program	At least 45 calendar days before beginning surveys, Revolution Wind must complete, obtain concurrence from the U.S. Department of the Interior (DOI), and adopt an avian and bat monitoring plan (ABMP), as described in Revolution Wind's *Avian and Bat Post-Construction Monitoring Framework* (BRI 2022) in COP Appendix AA (BRI 2023), including coordination with interested stakeholders. The DOI will review the ABMP and provide any comments on the plan within 30 calendar days of its submittal. Revolution Wind must resolve all comments on the ABMP to the DOI's satisfaction before implementing the plan. Revolution Wind may conclude that the DOI has concurred in the ABMP	

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	if the DOI provides no comments on the plan within 30 calendar days of its submittal date. a. Monitoring. Revolution Wind must 1) install acoustic monitoring devices for bats for 2 years; 2) install Motus receivers within the wind farm; 3) refurbish up to two onshore Motus receiver stations; 4) provide funding for up to 150 Motus tags per year for up to 3 consecutive years; and 5) conduct a 1- to 2-year cross project radar study to measure migrant flux rates, flight heights, and marine bird avoidance. b. Annual Monitoring Reports. Revolution Wind must submit to BOEM (at renewable_reporting@boem.gov), the USFWS, and BSEE (at OSWSubmittals@bsee.gov) a comprehensive report after each full year of monitoring (preconstruction and postconstruction) within 6 months of completion of the last avian survey. The report must include all data, analyses, and summaries regarding ESA-listed and non-ESA-listed birds and bats. The DOI will use the annual monitoring reports to assess the need for reasonable revisions (based on subject matter expert analysis) to the ABMP. The DOI reserves the right to require reasonable revisions to the ABMP and may require new technologies as they become available for use in offshore environments. c. Postconstruction Quarterly Progress Reports. Revolution Wind must submit quarterly progress reports during the implementation of the ABMP to BOEM (at renewable_reporting@boem.gov) and the USFWS by the fifteenth 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. d. Monitoring Plan Revisions. Within 15 calendar days of submitting the annual monitoring report, Revolution Wind must meet with BOEM and the USFWS to discuss the following: the monitoring results; the potential need for revisions to the ABMP, including technical refinements or additional monitoring; and the potential need for any additional efforts to reduce impacts. If the DOI determines after this	

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	discussion that revisions to the ABMP are necessary, the DOI may require that Revolution Wind modify the ABMP. If the reported monitoring results deviate substantially from the impact analysis included in the Final EIS, Revolution Wind must transmit to the DOI recommendations for new mitigation measures and/or monitoring methods. e. Operational Reporting (Operations). Revolution Wind must submit to BOEM (at renewable_reporting@boem.gov) and BSEE (at OSWSubmittals@bsee.gov) an annual report summarizing the following monthly operational data calculated from 10-minute supervisory control and data acquisition (SCADA) for all turbines together in tabular format: the proportion of time the turbines were operational (spinning at > x rpm) each month, the average rotor speed (monthly rpms) of spinning turbines plus 1 standard deviation, and the average pitch angle of blades (degrees relative to rotor plane) plus 1 standard deviation. The DOI will use this information as inputs for avian collision risk models to assess whether the results deviate substantially from the impact analysis included in the Final EIS. f. Raw Data. Revolution Wind 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 the DOI and the USFWS, upon request for the duration of the lease. Revolution Wind must work with BOEM to ensure the data are publicly available. The USFWS may specify third-party data repositories that must be used, such as the Motus Wildlife Tracking System or MoveBank, and such parties and associated data standards may change over the duration of the monitoring plan.	
Adaptive mitigation for birds and bats	If the reported postconstruction bird and bat monitoring results (generated as part of Revolution Wind's *Avian and Bat Post-Construction Monitoring Framework* [BRI 2022]) indicate bird and bat impacts deviate substantially from the impact analysis included in this EIS, then Revolution Wind must make recommendations for new mitigation measures or monitoring methods.	This mitigation measure, if adopted, ensures that Project activities would not impact bats beyond the negligible to minor range of impacts discussed in this EIS.

Table 3.5-3. Additional Mitigation and Monitoring Measures under Consideration for Bats (Appendix F, Table F-3)

Mitigation Measure*	Description*	Expected Effect on Impacts from Action Alternatives
USFWS Biological Opinion Conservation Recommendation 2: Establish an Offshore Wind Adaptive Monitoring and Impact Minimization Framework to guide and coordinate monitoring, research and avian impacts assessment coastwide.	To address Service concerns related to potential effects of WTG operation on listed and other species of concern, at both the project and coastwide scales, the USFWS recommends that the BOEM develop and adopt an Offshore Wind Adaptive Monitoring and Impact Minimization Framework (Framework) for flying wildlife. Many details will need to be worked out, but here the USFWS provides some basic principles for establishment, adoption, and operation of the Framework. • Establish a Framework Principals Group to consist of representatives from the BOEM, the BSEE, the USFWS, State natural resource agencies responsible for management of birds, bats, and insect, and offshore wind energy developers/operators. • Develop and adopt a written Framework foundational document specifying: ○ the governance structure of the Principals Group; ○ the geographic coverage of the Framework; ○ the species covered by the Framework; and ○ the duration of the Framework. • Establish an annual operating budget for the Framework to be funded by offshore wind energy developers/operators. • Arrange for the Principals Group to meet at least annually, and for the Framework foundational document to be updated at least every 5 years. • Provide for experts (both internal and external to the Principals Group) to regularly assess new and improved technologies and methods for estimating collision risk of covered species and measuring or detecting collisions. Adopt and deploy such methods deemed most promising by the Principals Group.	Pursuant to 50 CFR 402.14(j), conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

Mitigation Measure*	Description*	Expected Effect on Impacts from Action Alternatives
	• Coordinate monitoring and research across wind energy projects. Share and pool data and research results coastwide. • Provide for experts (both internal and external to the Principals Group) to regularly assess new and improved technologies and methods for minimizing collision risk of covered species. Adopt and deploy such technologies/methods deemed most promising by the Principals Group. • Provide for experts (both internal and external to the Principals Group) to periodically assess new and improved technologies and methods for evaluating indirect effects to covered species from WTG avoidance behaviors (e.g., impacts to time and energy budgets). • Periodically assess the level and type of compensatory mitigation necessary to offset any unavoidable direct and indirect effects of WTG operation on covered species. Adopt and require the levels and types of mitigation deemed appropriate by the Principals Group. • Consider partnering with other stakeholders or cross-sector organizations to provide administrative, institutional, and technical support to the Principals Group.	

* Information in these rows was taken directly from the final biological opinion (USFWS 2023) and has not been edited.

3.5.2.6.1 Measures Incorporated into the Preferred Alternative

Mitigation measures resulting from consultations, authorizations, and permits listed in Table 3.5-2 and in Appendix F, Table F-2, are incorporated into Alternative G (Preferred Alternative). The additional measures would further define how the effectiveness and enforcement of EPMs would be ensured and improve accountability for compliance with EPMs by implementing an avian and bat monitoring program. Because these measures ensure the effectiveness of and compliance with EPMs that are already analyzed as part of the Proposed Action, implementation of these measures would not further reduce the impact level of the Proposed Action but would ensure that Project activities would not impact birds beyond the negligible to minor range of impacts discussed in this EIS and the data gathered from avian mortality reporting would be used to evaluate impacts and potentially lead to additional mitigation measures, if required (30 CFR 585.633(b)).

3.6 Benthic Habitat and Invertebrates (see section in main EIS)

3.7 Birds

3.7.1 Description of the Affected Environment and Environmental Consequences of the No Action Alternative for Birds

Geographic Analysis Area: The GAA for birds is the United States coastline from Maine to Florida (Figure 3.7-1). The offshore limit of the GAA is 100 miles (160.9 km) from the Atlantic Coast to capture the migratory movements of most species in this group. The onshore limit of the GAA is 0.5 mile (0.8 km) inland from the Atlantic Coast to cover onshore habitats used by the species that may be affected by offshore components of the Project as well as those species that could be affected by onshore Project components. The GAA was established to capture resident species and migratory species that winter as far south as South America and the Caribbean and those that breed in the Arctic or along the Atlantic Coast that travel through the area.

Affected Environment: Table A.8.3-1 in Appendix A of the Vineyard Wind 1 final EIS (BOEM 2021a), the SFWF final EIS (BOEM 2021b), and COP Appendix AA (BRI 2023), all incorporated here by reference, describe baseline conditions and the impacts, based on IPFs assessed, of ongoing and future activities other than offshore wind. These are further discussed below in the context of this Project. This section addresses potential impacts on bird populations that use inland, coastal, and offshore habitats, including both resident birds that use the Lease Area during all of (or portions of) the year and migrating birds with the potential to pass through the Lease Area during fall and/or spring migrations. Detailed information regarding species potentially present can be found in COP Appendix AA (BRI 2023) and COP Appendix K (VHB 2023). Given the differences in life history characteristics and habitat use between offshore, inland, and coastal bird species, the sections below provide a separate discussion of each group. This section also discusses migratory birds as well as bald and golden eagles. In addition, this section addresses federally listed threatened and endangered species, but further information is provided in the Project BA prepared for the USFWS (BOEM 2022, 2023a). Unless stated otherwise, special-status bird species are expected to be impacted similarly as described in general for other birds.

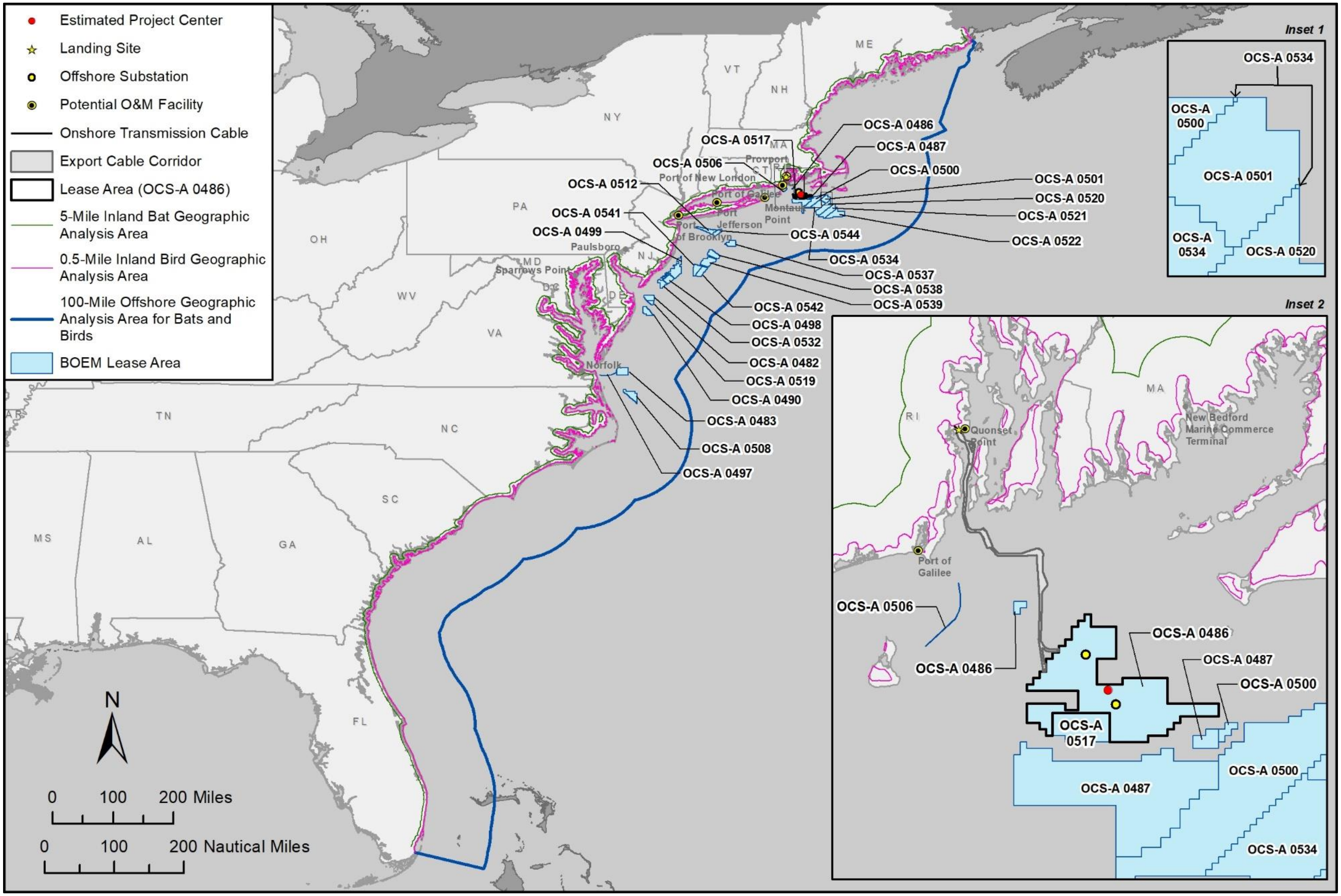

Figure 3.7-1. Geographic analysis area for birds.

Migrating Birds

The Atlantic Flyway, which follows the U.S. Atlantic coast, is an important migration route for many bird species moving from breeding grounds in New England and eastern Canada to winter habitats in North, Central, and South America. Bays, beaches, coastal forests, marshes, and wetlands provide important stopover and foraging habitat for migrating birds (MMS 2007). Both the onshore and offshore facilities associated with the Proposed Action are located within the Atlantic Flyway. Bird species using this flyway during spring and fall migrations have the potential to encounter proposed Project facilities. Despite the level of human development and activity present, the Mid-Atlantic Coast plays an important role in the ecology of many bird species. Chapter 4.2.9.3 of the Atlantic OCS EIS/EA (BOEM 2014a), incorporated here by reference, discusses the use of Atlantic Coast habitats by migrating birds.

All native birds (except certain game birds protected under state laws) are protected under the Migratory Bird Treaty Act of 1918 (MBTA). The official list of migratory birds protected under the MBTA, and the international treaties that the MBTA implements, is found at 50 CFR 10.13. The MBTA makes it illegal to “take” migratory birds, their eggs, feathers, or nests.[1] Under Section 3 of Executive Order 13186, BOEM and the USFWS established an MOU on June 4, 2009, which identifies specific areas in which cooperation between the agencies would substantially contribute to the conservation and management of migratory birds and their habitats (MMS and USFWS 2009). The purpose of the MOU is to strengthen migratory bird conservation through enhanced collaboration between the agencies. One of the underlying tenets identified in the MOU is to evaluate potential impacts to migratory birds and design or implement measures to avoid, minimize, and mitigate such impacts as appropriate (MMS and USFWS 2009: Sections C, D, E(1), F(1–3, 5), G(6)).

Within the Atlantic Flyway, much of the bird migration activity is concentrated along the coastline (Watts 2010). Waterbirds use a corridor between the coast and several miles out onto the Atlantic OCS, whereas land birds tend to use a wider corridor extending from the coastline to tens of miles inland (Watts 2010). Although both groups may occur over land or water within the Atlantic Flyway and may extend considerable distances from shore, the highest diversity and density are centered on the shoreline. Migrating terrestrial species using the Atlantic Flyway may follow the coastline during migration or use more direct flight routes over expanses of open water. Many marine birds also make annual migrations up and down the eastern seaboard (e.g., gannet, loon, and sea ducks), taking them directly through the northeastern region in spring and fall. This results in a complex ecosystem where the community composition shifts regularly and where temporal and geographic patterns are highly variable. The region supports large populations of birds in summer, some of which breed in the area (e.g., coastal gulls and terns). Other summer residents (e.g., shearwaters and storm-petrels) visit from the Southern Hemisphere (where they breed during the austral summer). In the fall, many of the summer residents leave the area and migrate south to warmer regions and are replaced by species that breed farther north and winter in the northeastern region of the United States.

BOEM funds scientific studies and partners with the USFWS to better understand how migratory birds use the Atlantic OCS and to refine the understanding of the risks from development to migratory species (BOEM 2020). BOEM uses information from these studies, the USFWS, and the scientific literature to

[1] As described under 50 CFR 10.12, “Take means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect.”

avoid leasing areas with high concentrations of migratory birds that are most vulnerable to offshore wind development. In addition, BOEM's stakeholder engagement during the delineation of the adjacent MA WEA resulted in the exclusion of 14 Atlantic OCS blocks that overlapped with high value sea duck habitat (BOEM 2013). BOEM worked with the USFWS to develop standard operating conditions for commercial leases and terms and conditions of plan approval that are intended to ensure that the potential for adverse impacts on birds is minimized. The standard operating conditions have been analyzed in recent EAs, consultations for lease issuance and site assessment activities, and BOEM's recent approval of the Virginia Offshore Wind Technology Advancement Project (BOEM 2015). Some of the standard operating conditions originated from BMPs in the ROD for the 2007 *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement* (MMS 2007:Section 2.7). BOEM and the USFWS will continue to work with lessees to develop postconstruction plans (e.g., those developed for the Vineyard Wind 1 final EIS (BOEM 2021a) and the SFWF final EIS (BOEM 2021b) aimed at monitoring the effectiveness of mitigative measures considered necessary to minimize impacts to migratory birds with the flexibility to consider the need for modifications or additions to the measures.

Regional Offshore and Inland Birds

The Lease Area is located within the Mid-Atlantic Bight, an oceanic region spanning Cape Cod, Massachusetts, to Cape Hatteras, North Carolina. A broad group of bird species may pass through the Lease Area and surrounding area, including migrants (e.g., raptors and songbirds), coastal birds (e.g., shorebirds, waterfowl, and waders), and marine birds (e.g., seabirds and sea ducks). See Table 3-1 in COP Appendix AA for a list of species that may pass through the Lease Area (BRI 2023). A high diversity of marine birds uses the Lease Area because it is located at the northern end of the Mid-Atlantic Bight, which overlaps northern and southern species assemblages (BRI 2023). Avian surveys were conducted within the Rhode Island Ocean Special Area Management Plan (OSAMP) study area, which included approximately 1,467 square miles (3,800 square kilometers [km^2]) with areas of the Block Island Sound, Rhode Island Sound, and the Atlantic continental shelf (Winiarski et al. 2012). Several methods were used to quantify the distributions and abundances of birds in the OSAMP study area, including land-based surveys, boat-based surveys, and aerial surveys. Survey data show that the use of these waters by coastal and marine birds is heaviest during winter months, peaking in early March to mid-April as birds prepare for and begin their spring migration. In general, coastal waters of less than 65.5 feet (20 m) in depth are important foraging habitat for diving ducks in winter, and nearshore shallow waters are important foraging habitat for locally breeding terns during summer months. Passerines use the air space during migration periods, and Block Island is an important stopover and resting spot for many species. Figures 3-7, 3-10, 3-12, and 3-13 in the Project's COP Appendix AA (BRI 2023) depict shorebirds; herons and egrets; songbirds; and coastal ducks, geese, swans, and grebes observed by season during OSAMP surveys, respectively.

The Marine-life Data and Analysis Team (MDAT) bird models (Curtice et al. 2019; Winship et al. 2018) describe regional-scale patterns of abundance with a range of environmental variables to produce long-term average annual and seasonal models. The MDAT Version 2 relative abundance and distribution models were produced for 47 bird species using U.S. Atlantic waters from Florida to Maine and thus provide an excellent regional context for local relative densities estimated from OSAMP surveys (see Part IV of COP Appendix AA) (BRI 2023). Overall, the MDAT models indicate avian abundance is greater closer to shore than in the Lease Area (see Figure 3-6 in COP Appendix AA) (BRI 2023).

A variety of passerines and other birds migrate along the Atlantic Coast and could fly over the onshore facilities' locations. Although most of the U.S. coastline is disturbed from previous anthropogenic uses, there are several different key habitats present that are suitable to a range of wildlife species. Bird species observed during field investigations and a list of birds that could occur based on habitat preferences within the GAA are listed in Tables C-1 through C-3 in Appendix C in COP Appendix K (VHB 2023).

Overall, birds in the northeastern United States are subject to pressure from ongoing activities, particularly accidental releases of fuel/fluids/hazardous materials (hazmat), sediment, and/or trash and debris; new cable emplacement; interactions with fisheries and fishing gear; and climate change. More than one-third of bird species that occur in North America (37%, 432 species) are at risk of extinction unless significant conservation actions are taken (North American Bird Conservation Initiative [NABCI] 2016). This is likely representative of the conditions of birds within the GAA. The northeastern United States is also home to more than one-third of the human population of the nation. As a result, species that live or migrate through the Atlantic Flyway have historically been, and will continue to be, subject to a variety of ongoing anthropogenic stressors, including hunting pressure (approximately 86,000 sea ducks harvested annually [Roberts 2019]), commercial fisheries bycatch (approximately 2,600 seabirds killed annually on the Atlantic [Hatch 2017; Sigourney et al. 2019]), and climate change, all of which have the potential to adversely impact bird species. According to the NABCI, more than half of the offshore bird species (57%, 31 species) have been placed on the NABCI watch list because of their small ranges, small and declining populations, and threats to required habitats (NABCI 2016). Globally, monitored offshore bird populations have declined by nearly 70% from 1950 to 2010, which may be representative of the overall population trend of seabirds (Paleczny et al. 2015) that may forage, breed, and migrate over the Atlantic OCS. Overall, offshore bird populations are decreasing, although considerable differences in population trajectories of offshore bird families have been documented (NABCI 2016).

Coastal birds, especially those that nest in coastal marshes and other low-elevation habitats, are vulnerable to the rising sea level and the increasing frequency of strong storms due to global warming. According to the NABCI, nearly 40% of the more than 100 bird species that rely on coastal habitats for breeding or migration are on the NABCI watch list. Many of these coastal species have small population sizes and/or restricted distributions, resulting in an increased vulnerability to habitat loss/degradation and other stressors (NABCI 2016). These ongoing impacts on birds would continue regardless of the offshore wind industry. Some of the main drivers of bird population declines include habitat loss, habitat fragmentation, collisions with glass windows and power lines, invasive species, predators, toxic chemicals, and climate change (Mass Audubon 2011, 2013, 2017).

Avian exposure assessments for the Project were conducted for species-season combinations using MDAT and/or OSAMP data (BRI 2023). To assess bird exposure at the local (i.e., MI/RI WEA) and regional scales (i.e., U.S. Atlantic waters), the Lease Area was compared to other similarly sized areas in each dataset for each season and species. Estimated exposure for each season and species was given a final score (see Table 3-4 in BRI [2023]), which was categorized as minimal (a combined score of 0), low (combined score of 1–2), medium (combined score of 3–4), or high (combined score of 5–6). The exposure scores for each species and season, as well as the aggregated scores (e.g., the annual scores for each species and taxonomic group), should be interpreted as a measure of the relative importance of the Lease Area for a species/group, as compared to other surveyed areas in the region and in the northwest Atlantic. Qualitative exposure determinations were developed using the quantitative assessment of exposure (described above), other locally available data, existing literature, and species accounts. Maps showing the results of the exposure assessment can be found in Part VI of COP Appendix AA (BRI 2023).

The Lease Area is generally far enough offshore as to be beyond the range of most breeding terrestrial or coastal bird species. Coastal birds that may forage in the Lease Area occasionally, visit the area sporadically, or pass through on their spring and/or fall migrations include shorebirds (e.g., sandpipers, plovers), waterbirds (e.g., cormorants, grebes), waterfowl (e.g., scoters, mergansers), wading birds (e.g., herons, egrets), raptors (e.g., falcons, eagles), and songbirds (e.g., warblers, sparrows). Overall, except for migratory falcons and songbirds, coastal birds are considered to have minimal exposure to the Lease Area. Falcons, primarily peregrine falcons (*Falco peregrinus*), may be exposed to the Lease Area. Of the marine birds, loons, sea ducks, gulls, terns, and auks received up to a medium overall exposure assessment. Some migratory songbirds, particularly blackpoll warblers (*Setophaga striata*), may also be exposed to the Lease Area during fall migration (BRI 2023).

Special-Status Species

Three bird species listed under the ESA are present in the region: piping plover (*Charadrius melodus*) (threatened), rufa red knot (*Calidris canutus rufa*) (threatened), and roseate tern (*Sterna dougallii*) (endangered). The Atlantic population of piping plover nests on beaches in the northeastern U.S. coastal region and will also migrate (spring and fall) through the Lease Area to and from breeding sites. Rufa red knots winter in southern states or in Central or South America and may pass through the Lease Area during migration (spring and fall) in transit to and from Arctic breeding sites. Roseate terns also migrate through the Lease Area in the spring and fall on their way to and from breeding sites in New York, the New England states, and Atlantic Canada.

BOEM prepared a BA to address Project effects to federally listed species under the jurisdiction of the USFWS, pursuant to Section 7 of the ESA (BOEM 2022, 2023a).

BOEM submitted the BA to the USFWS on November 17, 2022, requesting initiation of consultation under Section 7 of the ESA, and the USFWS responded on November 25, 2022, with a letter of consultation initiation. BOEM requested concurrence on its conclusion in the BA that the impacts of the proposed activities are expected to be discountable and insignificant, and thus *may affect but are not likely to adversely affect* piping plover, roseate tern, and rufa red knot. There are no critical habitats designated for these species in the action area (which includes the Lease Area) defined in the BA (BOEM 2022). An addendum to the BA was submitted to the USFWS on January 12, 2023, providing updates to the Stochastic Collision Risk Assessment for Movement (SCRAM) model for the rufa red knot (BOEM 2023a). The updated model output did not change the effect determinations in the November BA (BOEM 2022, 2023a). Another addendum to the BA was submitted to the USFWS on April 13, 2023. In this BA addendum, based on the updated SCRAM model, BOEM's determinations for roseate tern and piping plover remained the same where the Proposed Action would not likely adversely affect roseate tern and piping plover for both SCRAM modeling scenarios (BOEM 2023b). However, BOEM revised its previous determination for the red knot and determined that the Proposed Action is likely to adversely affect red knot (BOEM 2023a). The USFWS, in its biological opinion (BO) dated May 30, 2023, concurred with BOEM's determinations for roseate tern and rufa red knot but determined that the Proposed Action is likely to adversely affect piping plover as well (USFWS 2023).

To assess if any special-status species have the potential to occur in the onshore portion of the Lease Area, information from the Rhode Island Department of Environmental Management (DEM) Environmental Resource Map (ERM) was evaluated and an official species list from the USFWS IPaC tool was generated on September 28, 2019, regarding the landfall envelope, the onshore transmission cable routes, the OnSS, and the interconnection cable route (VHB 2023). VHB used the Information for Planning and Consultation (IPaC) tool to generate lists of bird species protected under the MBTA that have been designated as Birds of Conservation Concern (BCC) by the USFWS within the proposed limits of the onshore facilities during development of the *Onshore Natural Resources and Biological Assessment* (VHB 2023). BCC are species that without additional conservation actions are likely to become candidates for listing under the ESA (USFWS 2021). Table 4.3.6-3 in the COP provides the list of BCC with the potential to occur within the limits of the onshore facilities and indicates which of these species were observed during field investigations. According to the Rhode Island DEM ERM, there are no records of state-listed species within the GAA (VHB 2023). Migratory bird species with potential to occur near proposed onshore facilities are also presented in Table 4 of COP Appendix K (VHB 2023).

Bald and Golden Eagles

Eagles have additional federal protection (besides under the MBTA) under the Bald and Golden Eagle Protection Act. The general morphology of both bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) dissuades long-distance movements in offshore settings (Kerlinger 1985). These two species generally rely upon thermal formation, which develops poorly over the open ocean, during long-distance movements. The bald eagle is present year-round in Massachusetts and Rhode Island, and its numbers have been slowly increasing over approximately the last 30 years. They are rarely observed in offshore surveys (Williams et al. 2015; all observations < 3.7 miles [6 km] from shore), which supports the notion that bald eagles do not venture far from land. Although bald eagles could be present near the proposed onshore facilities and would most likely be present in late April, no bald eagles were observed during field investigations (VHB 2023). Bald and golden eagles are not expected to occur within the Lease Area, but some potential exists for effects (e.g., displacement due to noise, habitat loss/modification, and injury/mortality due to contact with construction equipment) resulting from the construction and installation, O&M, and decommissioning of the onshore facilities.

3.7.2 Environmental Consequences

3.7.2.1 Relevant Design Parameters, Impact-Producing Factors, and Potential Variances in Impacts

This assessment analyzes the maximum-case scenario; however, there is the potential for variances in the proposed Project build-out, as defined in the PDE (see Appendix D). The Project design parameters that would influence the magnitude of the impacts on birds include the number, size, and location of WTGs; the location of the OnSS and ICF; the type of lighting to be used; the location of construction within the landfall work area and within the transmission cable envelope; and the time of year during which construction occurs. Impacts associated with construction of onshore elements of the Proposed Action during the breeding season for birds could be avoided if onshore construction occurs outside of this time frame.

The following EPMs would be implemented to minimize potential impacts to birds (see Appendix F, Table F-1):

- Revolution Wind evaluated siting alternatives for the OnSS using the criteria that included avoidance or minimization of disturbance to ecologically sensitive areas.
- Onshore facilities would be sited within previously disturbed and developed areas to the extent practicable, as follows:
  - The OnSS and ICF would be located on parcels that are already highly altered and include buried demolition waste.
  - The transmission cable would be located primarily in unvegetated and previously disturbed or developed ROWs.
- The onshore transmission cables would be buried and would therefore avoid the risk to avian and bat species associated with overhead lines.
- To the extent feasible, tree and shrub removal for onshore facilities would occur outside the avian nesting and bat roosting period (May 1 through August 15). If tree and shrub removal cannot be avoided during this season, Revolution Wind would coordinate with appropriate agencies to determine appropriate course of action.
- Construction and operational lighting would be limited to the minimum necessary to ensure safety and compliance with applicable regulations.
- Revolution Wind is committed to an indicative layout scenario with WTGs sited in a grid with approximately 1.15-mile (1-nm) × 1.15-mile (1-nm) spacing that aligns with other proposed adjacent offshore wind projects in the RI/MA WEA. This wide spacing of WTGs would allow avian and bat species to avoid individual WTGs and minimize risk of potential collision.
- Revolution Wind would comply with FAA and USCG requirements for lighting while using lighting technology (e.g., low-intensity strobe lights) that minimizes impacts on avian species.
- Accidental spill or release of oils or other hazardous materials offshore would be managed through the OSRP.
- All vessels would comply with USCG and EPA regulations that require operators to develop waste management plans, post informational placards, manifest trash sent to shore, and use special precautions such as covering outside trash bins to prevent accidental loss of solid materials. Vessels would also comply with BOEM lease stipulations that require adherence to NTL 2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, requires the posting of placards at prominent locations on offshore vessels and structures, and mandates a yearly marine trash and debris awareness training and certification process.
- An SESC plan, including erosion and sedimentation control measures, would be implemented to minimize potential water quality impacts during construction and operation of the onshore facilities.
- Revolution Wind has developed a draft avian and bat postconstruction monitoring plan (see Appendix G and COP Appendix AA [BRI 2023]) for the Project that summarizes the approach to monitoring; describes overarching monitoring goals and objectives; identifies the key avian species, priority questions, and data gaps unique to the region and Lease Area that will be addressed through monitoring; and describes methods and time frames for data collection, analysis, and reporting. Postconstruction monitoring will assess impacts of the Project with the

purpose of filling select information gaps and supporting validation of the Project's avian risk assessment. Focus may be placed on improving knowledge of ESA-listed species occurrence and movements offshore, avian collision risk, species/species-group displacement, or similar topics. Where possible, monitoring conducted by Revolution Wind would build on and align with postconstruction monitoring conducted by the other Orsted/Eversource offshore wind projects in the Northeast. Revolution Wind would engage with federal and state agencies and environmental groups (eNGOs) to identify appropriate monitoring options and technologies and to facilitate acceptance of the final plan.

- Revolution Wind would document any dead (or injured) birds/bats found incidentally on vessels and structures during construction, O&M, and decommissioning and provide an annual report to BOEM and USFWS.
- Revolution Wind would continue to coordinate with RIDEM and NOAA NMFS regarding TOY restrictions through the permitting process and will adhere to requirements imposed by these agencies.
- Revolution Wind would use an ADLS (or a similar system), pursuant to approval by the FAA and commercial and technical feasibility at the time of facility design report (FDR)/Fabrication and installation report (FIR) approval.

These EPMs would be implemented across all alternatives; therefore, BOEM would not expect measurable potential variances in impacts across the alternatives.

See Appendix E1 for a summary of IPFs analyzed for birds across all action alternatives. IPFs that are either not applicable to the resource or determined by BOEM to have a negligible adverse effect are excluded from Chapter 3 and provided in Table E1-3 in Appendix E1. Offshore and onshore IPFs are addressed separately in the analysis if appropriate for the resource; not all IPFs have both an offshore and onshore component. Where feasible, calculations for specific alternative impacts are provided in Appendix E4, to facilitate reader comparison across alternatives.

Table 3.7-1 provides a summary of IPF findings carried forward for analysis in this section. Each alternative analysis discussion consists of the construction and installation phase, the O&M phase, the decommissioning phase, and the cumulative analysis. If these analyses are not substantially different, then they are presented as one discussion.

A detailed analysis of the Proposed Action is provided following the table. Detailed analysis of other considered action alternatives is also provided below the table if analysis indicates that the alternative(s) would result in substantially different impacts than the Proposed Action.

The Conclusion section within each alternative analysis discussion includes rationale for the effects determinations.

The overall impact to birds from any action alternative would be **minor** adverse, as the effects would be small, and the resource would recover completely, with no mitigating action required.

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Table 3.7-1. Alternative Comparison Summary for Birds

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
Accidental releases and discharges	Future offshore wind and non-wind activities could expose coastal offshore waters to contaminants (e.g., fuel, sewage, solid waste, or chemicals, solvents, oils, or grease from equipment) in the event of a spill or release during routine vessel use. Vessel compliance with USCG regulations would minimize trash or other debris; therefore, BOEM expects accidental trash releases from offshore wind vessels to be rare. All future offshore wind projects would be required to comply with regulatory requirements related to the prevention and control of accidental spills administered by the USCG and BSEE. OSRPs are required for each project and would provide for rapid spill response, cleanup, and other measures that would help to minimize potential impacts on affected resources from spills. Based on the low risk of spills from vessels due to implementation of safe handling, storage, and cleanup procedures, impacts from accidental spills and trash would represent a **negligible** adverse impact to birds.	**Offshore**: Potential adverse impacts to birds from contaminant discharges or releases or from improper disposal of trash or debris during construction would be avoided or minimized with adherence to federal, state, and local regulations regarding disposal of solid and liquid wastes, resulting in short-term **negligible** to **minor** adverse impacts. Accidental releases, if any, would occur infrequently at discrete locations and vary widely in space and time; for this reason, BOEM expects localized and temporary **negligible** adverse impacts on birds. Impacts to birds from this IPF during operation and decommissioning of the offshore facilities would be similar to offshore construction impacts and result in short-term **negligible** to **minor** adverse impacts with compliance with USCG requirements and BSEE regulations. In the context of reasonably foreseeable environmental trends, the combined impacts from this IPF from ongoing and planned actions, including the Proposed Action, would be likely limited in extent and duration and would result in localized and temporary **negligible** adverse cumulative impacts on birds.	**Offshore**: Alternatives C through F would reduce the number of WTGs, potentially resulting in a reduced amount of offshore construction equipment and vessels required, thereby resulting in a negligible decreased risk for accidental releases and discharges. However, no measurable change from Proposed Action construction impacts to birds from this IPF is anticipated, which are expected to be localized and temporary **negligible** to **minor** adverse. Impacts to birds from this IPF during operation and decommissioning of the offshore facilities are expected to be similar to offshore construction impacts, and no measurable change from Proposed Action construction impacts to birds from this IPF is anticipated, which are expected to be **negligible** to **minor** adverse. Future offshore wind activities would contribute to an increased risk of spills and associated impacts due to fuel, fluid, or hazmat exposure. The contribution from future offshore wind and Alternatives C through F would be a low and non-measurable percentage of the overall spill risk from ongoing activities. In the context of reasonably foreseeable environmental trends, the combined impacts from this IPF from ongoing and planned actions, including Alternatives C through F, would be likely limited in extent and duration of a release and result in localized and temporary **negligible** adverse cumulative impacts to birds.				**Offshore**: Similar to Alternatives C through F, Alternative G would reduce the number of WTGs, resulting in no measurable change from Proposed Action construction, O&M, and decommissioning impacts to birds from this IPF is anticipated, which are expected to be localized and temporary (for construction) **negligible** to **minor** adverse. Future offshore wind activities would contribute to an increased risk of spills and associated impacts due to fuel, fluid, or hazmat exposure. The contribution from future offshore wind and Alternative G would be a low and non-measurable percentage of the overall spill risk from ongoing activities. In the context of reasonably foreseeable environmental trends, the combined impacts from this IPF from ongoing and planned actions, including Alternative G, would be likely limited in extent and duration of a release and result in localized and temporary **negligible** adverse cumulative impacts to birds.
		Onshore: Onshore, construction and HDD activities could result in the accidental releases of fuel, fluids, or hazmat; sediment; and/or trash and debris. Based on the low risk of spills due to implementation of safe handling, storage, and cleanup procedures, impacts from accidental spills and trash would represent a localized and temporary **negligible** adverse impact to birds. The OnSS would require various oils, fuels, and lubricants to support its operation. Accidental discharges, releases, and disposal could indirectly cause bird habitat degradation; however, risks would be avoided through spill prevention and control measures and associated BMPs. Therefore, potential adverse impacts associated with discharges and releases are considered short term and localized **negligible** adverse.	**Onshore**: Alternatives C through F would not alter impacts to onshore activities; therefore, impacts would be the same as those described for the Proposed Action: temporary to short term **negligible** adverse.				**Onshore**: Alternative G would not alter onshore activities; therefore, impacts would be the same as those described for the Proposed Action: temporary to short term **negligible** adverse.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
		In the context of reasonably foreseeable environmental trends, the combined impacts from this IPF from ongoing and planned actions, including the Proposed Action, would be localized and temporary due to the likely limited extent and duration of a release and result in **negligible** adverse cumulative impacts to birds.					
Anchoring and new cable emplacement/ maintenance	A small amount of infrequent construction impacts associated with onshore power infrastructure would be required over the next 6 to 10 years to tie future offshore wind energy projects to the electric grid. Typically, this would require only small amounts of habitat removal, if any, and would occur primarily in previously disturbed areas. Where future offshore wind activities overlap the GAA, there would be increased anchoring of vessels during survey activities and during the construction and installation, O&M, and decommissioning of offshore components. Disturbed seafloor from construction of future offshore wind projects and anchoring may affect diving birds' foraging success or may affect some prey species (e.g., benthic assemblages); however, impacts would be temporary and localized, and birds would be able to successfully forage in adjacent areas and would not be affected by increased suspended sediments and no population-level impacts would occur. Therefore, adverse impacts would be **minor**.	**Offshore**: Seafloor disturbed by cable installation and dredging prior to cable installation would result in turbidity effects that could reduce marine bird foraging success or have temporary and localized impacts on marine bird prey species. Vessel anchoring during construction would also result in increased turbidity. Individual birds would successfully forage in nearby areas not affected by increased turbidity/sedimentation during anchoring and cable emplacement, and only nonmeasurable **negligible** adverse impacts, if any, on individuals or populations would be expected given the localized and temporary nature of construction activities. Other than temporary increases in turbidity from seafloor disturbance due to occasional vessel anchoring, no impacts to bird species are anticipated during the O&M phase for the offshore RWF or RWEC. Impacts from decommissioning would be similar to construction impacts unless the RWEC is abandoned in place: **negligible** adverse. In the context of reasonably foreseeable environmental trends, the combined cable emplacement impacts from ongoing and planned actions, including the Proposed Action, could occur if impacts are in close temporal and spatial proximity. However, these adverse impacts from anchoring and cable emplacement would be **negligible** and would not be biologically significant. For these reasons, the Proposed Action when combined with other past, present, and reasonably foreseeable projects would result in short-term **negligible** to **minor** cumulative adverse impacts to birds.	**Offshore**: Alternatives C through F would reduce the number of WTG foundations and IACs. Reduced habitat disturbance from foundation and IAC installation could negligibly decrease turbidity that could alter the behavior of bird species. Therefore, BOEM would expect a similar but lower impact to birds than the Proposed Action: temporary, lasting up to 12 hours, localized and nonmeasurable **negligible** adverse impacts. Similar to the Proposed Action, no impacts to bird species are anticipated during the O&M phase for the offshore RWF or RWEC. Impacts from decommissioning would be similar to construction impacts unless the RWEC is abandoned in place: **negligible** adverse. Alternatives C through F would add 5,821 to 6,994 acres of seafloor disturbance from the RWEC and IAC installation and anchoring compared to the No Action Alternative, which represents up to 6% of the total seafloor disturbance estimated under the No Action Alternative. This would result in localized turbidity effects that could reduce marine bird foraging success or impact marine bird prey species. However, individual birds would be expected to successfully forage in nearby areas not affected by increased turbidity, and only nonmeasurable negligible impacts, if any, on individuals or populations would be expected given the localized and temporary nature of the potential impacts. In the context of reasonably foreseeable environmental trends, the combined cable emplacement and anchoring impacts from ongoing and planned actions, including Alternatives C through F, could occur if impacts are in close temporal and spatial proximity. However, these adverse impacts from anchoring and cable emplacement would be negligible and would not be biologically significant. For these reasons, these alternatives in combination with other past, present, and reasonably foreseeable projects would result in short-term **negligible** to **minor** adverse cumulative impacts to birds.				**Offshore**: Similar to Alternatives C through F, Alternative G would reduce the number of WTG foundations and IACs, resulting in temporary (for construction), lasting up to 12 hours, localized and nonmeasurable **negligible** adverse impacts. Similar to the Proposed Action, no impacts to bird species are anticipated during the O&M phase, and impacts from decommissioning would be similar to construction impacts unless the RWEC is abandoned in place: **negligible** adverse. Alternative G would add 5,498 acres of seafloor disturbance from RWEC and IAC installation and anchoring compared to the No Action Alternative, which represents up to 5% of the total seafloor disturbance estimated under the No Action Alternative. This would result in localized turbidity effects that could reduce marine bird foraging success or impact marine bird prey species. However, individual birds would be expected to successfully forage in nearby areas not affected by increased turbidity, and only nonmeasurable negligible impacts, if any, on individuals or populations would be expected given the localized and temporary nature of the potential impacts. In the context of reasonably foreseeable environmental trends, the combined cable emplacement and anchoring impacts from ongoing and planned actions, including Alternative G, could occur if impacts are in close temporal and spatial proximity. However, these adverse impacts from anchoring and cable emplacement would be negligible and would not be biologically significant. For these reasons, these alternatives in combination with other past, present, and reasonably foreseeable projects would result in short-term **negligible** to **minor** adverse cumulative impacts to birds.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
		Onshore: Land disturbance and habitat alteration resulting from construction within the landfall work area may result in the direct injury or mortality of bird species. Mitigations like observing time-of-year restrictions on vegetation removal would avoid the breeding season of birds, thus reducing the likelihood of injury and/or mortality from construction activities. Therefore, the impacts (e.g., injury and/or mortality) resulting from land disturbance and habitat alteration would be temporary **negligible** adverse. Additionally, construction work within the landfall work area would occur largely outside of the breeding period of listed species that might nest in the area, and because use of the shoreline by shorebirds within the landfall work area has not been documented (VHB 2023), onshore impacts for listed species from land disturbance would also be **negligible** adverse. Onshore transmission cable installation would also result in temporary ground disturbance. Most of the temporary ground disturbance would occur in previously disturbed areas along paved roads or parking lots and would not result in impacts to bird habitat. Operation of the onshore transmission cable would pose no risk to birds because it would be buried. Land disturbance in the form of vegetation management would occur on a periodic basis to maintain vegetation at shrub height within the perimeters of the onshore facilities. Land disturbance as it relates to vegetation clearing may result in the direct injury or mortality of birds. However, mortality and injury impacts would be mitigated by observing time-of-year restrictions on vegetation removal that would avoid the breeding season of bird species. Therefore, the adverse impacts resulting from this IPF would be **negligible**. The contribution of the Proposed Action on adverse cumulative impacts to birds from new cable emplacement or maintenance in the context of reasonably foreseeable onshore environmental trends within the GAA is expected to be **negligible** adverse.	**Onshore**: Alternatives C through F would not alter impacts to onshore activities; therefore, impacts would be the same as those described for the Proposed Action: **negligible** adverse.				**Onshore**: Alternative G would not alter onshore activities; therefore, impacts would be the same as those described for the Proposed Action: **negligible** adverse.
Climate change	Impacts associated with climate change (i.e., increased storm severity and frequency, ocean acidification, altered	**Offshore**: Construction of the offshore facilities would result in a small temporary increase in GHG emissions within the GAA during the construction	**Offshore**: Alternatives C through F would reduce the number of WTGs, potentially resulting in a reduced number of GHG-emitting construction vessels and/or aircraft. However, no measurable change from Proposed Action construction impacts to birds				**Offshore**: Similar to Alternatives C through F, Alternative G would reduce the number of WTGs, potentially resulting in a reduced

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
	migration patterns, increased disease frequency, habitat conversion, and increased erosion and sediment deposition) could result in long-term **minor** adverse risks to birds and could lead to changes in prey abundance and distribution, changes in nesting and foraging habitat abundance and distribution, and changes to migration patterns and timing. However, future offshore wind development activities may beneficially contribute to a broader combination of actions to reduce future impacts to birds from climate change over the long term due to reduced reliance on fossil fuel–generated energy sources.	phase. As a result, adverse impacts to birds from construction of the Proposed Action associated with climate change would be short term **negligible** adverse. The expected impacts on climate change from operation of the offshore facilities alone would not result in a measurable increase in the adverse impacts to birds beyond those described under the No Action Alternative. In addition, operation of the Proposed Action could also contribute to a long-term net decrease in GHG emissions, but this change would likely not be measurable. Therefore, BOEM expects the impacts from the Proposed Action on climate change would be long term **negligible**. The types of impacts from global climate change described for the No Action Alternative would occur under the Proposed Action. Therefore, long-term **minor** adverse and long-term **negligible** beneficial cumulative impacts to birds are expected.	from this IPF is anticipated, which are expected to be short term **negligible** adverse. Likewise, no measurable change from Proposed Action operational impacts to birds is anticipated, which are expected to be long term **negligible** adverse. The types of impacts from global climate change described for the No Action Alternative would occur under Alternatives C through F. However, Alternatives C through F could also contribute to a long-term net decrease in GHG emissions. This difference may not be measurable but would help reduce climate change impacts. Therefore, long-term **minor** adverse and long-term **negligible** beneficial cumulative impacts to birds are expected.				number of GHG-emitting construction vessels and/or aircraft. However, no measurable change from Proposed Action construction and O&M impacts to birds from this IPF is anticipated, and impacts are expected to be short term **negligible** adverse (construction) and long term **negligible** adverse (O&M). The types of impacts from global climate change described for the No Action Alternative would occur under Alternative G. However, Alternative G could also contribute to a long-term net decrease in GHG emissions. This difference may not be measurable but would help reduce climate change impacts. Therefore, long-term **minor** adverse and long-term **negligible** beneficial cumulative impacts to birds are expected.
		Onshore: Onshore impacts to birds associated with climate change from construction and decommissioning of the Proposed Action would be similar to those discussed above for offshore facilities and activities: short term **negligible** adverse. No measurable climate change impacts to birds from O&M of the onshore facilities are expected. Therefore, the adverse impacts from this IPF are expected to be long term **negligible** adverse. The types of impacts from global climate change described for the No Action Alternative would occur under the Proposed Action. Therefore, the combined impacts from this IPF from ongoing and planned actions, including the Proposed Action and cumulative impacts, are expected to be long term **minor** adverse.	**Onshore**: Alternatives C through F would not alter onshore activities; therefore, construction and operational impacts would be the same as those described for the Proposed Action: short term to long-term **negligible** adverse. Cumulative impacts would also be the same as those described for the Proposed Action: long term **minor** adverse.				**Onshore**: Alternative G would not alter onshore activities; therefore, construction and operational impacts would be the same as those described for the Proposed Action: short term to long term **negligible** adverse. Cumulative impacts would also be the same as those described for the Proposed Action: long term **minor** adverse.
Light	Nighttime lighting associated with offshore structures and vessels could represent a source of bird attraction. Vessel lighting would be temporary and result in a **minor** adverse impact to birds; structure lighting may pose an increased collision or predation risk (Hüppop et al. 2006), although this risk would be localized in extent and minimized using BOEM lighting guidelines (BOEM 2021c; Kerlinger et al.	**Offshore**: Lighting used during construction would be limited to the minimum required for safety during construction activities to minimize potential impacts. Therefore, adverse impacts to birds from lighting during construction would be localized and temporary **negligible** to **minor** adverse. Under the Proposed Action, up to 100 WTGs and up to two OSSs would be lit with USCG navigational and FAA hazard lighting. These lights have some potential to attract birds and result in increased collision risk (Hüppop et al. 2006). However, the mandatory use of	**Offshore**: Although the number and duration of construction vessels and work areas requiring nighttime lighting could be slightly reduced under Alternatives C through F, no measurable change from Proposed Action construction impacts to birds is anticipated, which are expected to be localized and temporary **negligible** to **minor** adverse. Alternatives C through F would reduce nighttime lighting, thereby negligibly decreasing the risk of avian injury or mortality from collision with WTGs as compared to the Proposed Action, and impacts are expected to be long term **negligible** adverse. Alternatives C through F would add 56 to 93 new WTGs with red flashing aviation hazard lighting to the No Action Alternative; these lights could attract birds and result in increased collision risk (Hüppop et al. 2006). Additionally, marine navigation lighting				**Offshore**: Similar to Alternatives C through F, the number and duration of construction vessels and work areas requiring nighttime lighting could be slightly reduced under Alternative G, and no measurable change from Proposed Action construction impacts to birds is anticipated, and impacts would be localized and temporary **negligible** to **minor** adverse. Alternative G would reduce nighttime lighting for operations, negligibly decreasing the risk of avian injury or mortality from collision with

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	2010), and therefore would also be a **minor** adverse impact.	red flashing aviation obstruction lights, the avoidance of any steady-burning aviation obstruction lights, and the use of ADLS (see Table F-2 in Appendix F for details) are expected to minimize bird attraction and therefore collision risk (Kerlinger et al. 2010; Orr et al. 2016). For this reason, BOEM expects adverse impacts, if any, to be long term **negligible** adverse from offshore lighting. Ongoing and future non–offshore wind activities are expected to cause short-term impacts, primarily from vessel lights. For these reasons, the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in long-term **negligible** to **minor** adverse cumulative impacts to birds, and no individual or population-level impacts would be expected.	would include one or more flashing white lights on each WTG and the OSSs and would be directed out and down to the water surface. Vessel lights during construction and installation, O&M, and decommissioning would be minimal and limited to vessels transiting to and from wind farm areas. Ongoing and future non–offshore wind activities are expected to cause short-term impacts, primarily from vessel lights. For these reasons, Alternatives C through F when combined with past, present, and reasonably foreseeable activities would result in long-term **negligible** to **minor** cumulative adverse impacts to birds because no individual or population-level impacts would be expected.				WTGs as compared to the Proposed Action, and impacts are expected to be long term **negligible** adverse. Alternative G would add 65 WTGs with red flashing aviation hazard lighting to the No Action Alternative; these lights could attract birds and result in increased collision risk (Hüppop et al. 2006). Additionally, marine navigation lighting would include one or more flashing white lights on each WTG and the OSSs and would be directed out and down to the water surface. Vessel lights during construction and installation, O&M, and decommissioning would be minimal and limited to vessels transiting to and from wind farm areas. Ongoing and future non–offshore wind activities are expected to cause short-term impacts, primarily from vessel lights. For these reasons, Alternative G when combined with past, present, and reasonably foreseeable activities would result in long-term **negligible** to **minor** cumulative adverse impacts to birds because no individual or population-level impacts would be expected.
		Onshore: Most of the onshore construction would occur during the daylight hours, although some overnight lighting may occasionally be necessary during construction of the onshore facilities. However, this is not expected to have a measurable effect on bird behavior, therefore BOEM anticipates temporary **negligible** adverse impacts to birds. During the O&M of the OnSS and ICF, yard lighting would be used for assessment of equipment. Most decommissioning activities would occur during the day, and overnight lighting would only be necessary if there is work in progress on-site or lights are left on for safety and security purposes. Therefore, the adverse impacts resulting from this IPF would be long term **negligible**. Ongoing and future onshore activities could contribute to impacts to birds from light if they occur at the same time within the GAA. However, these effects are also expected to be localized and temporary and would not contribute to adverse cumulative impacts to birds in the GAA.	**Onshore**: Alternatives C through F would not alter impacts to onshore activities; therefore, construction and operational impacts would be the same as those described for the Proposed Action: temporary to long-term **negligible** adverse. Cumulative impacts would also be the same as those described for the Proposed Action: localized and temporary **negligible** to **minor** adverse.				**Onshore**: Alternative G would not alter impacts to onshore activities; therefore, construction and operational impacts would be the same as those described for the Proposed Action: temporary to long-term **negligible** adverse. Cumulative impacts would also be the same as those described for the Proposed Action: localized and temporary **negligible** to **minor** adverse.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
Noise	Multiple offshore wind project construction periods are anticipated between 2022 and 2027. Construction noise sources will include, most notably, pile driving as well as geological and geophysical surveys, offshore and onshore construction, and aircraft and vessel traffic. These would create noise and may temporarily impact some bird species by displacing them and changing their behavior. Vessel and aircraft noise could also disturb some individual diving birds, but they would acclimate to the noise or move away, potentially resulting in temporary displacement. Collectively, these noise sources would be temporary and localized, resulting in a **minor** adverse impact to these birds.	**Offshore**: **Negligible** to **minor** adverse impacts to birds would occur from construction noise related to pile driving as well as geological and geophysical surveys and aircraft and vessel traffic. These activities could flush birds in the path of vessels, causing temporary displacement from the area. Impacts to birds from operational noise and decommissioning of the offshore facilities would be similar to offshore construction impacts and result in **negligible** adverse impacts. Pile-driving and other construction noise and activity associated with the Proposed Action could add to baseline noise and activity associated with other offshore wind projects with overlapping construction periods. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **negligible** to **minor** adverse cumulative impacts to birds.	**Offshore**: Alternatives C through F would slightly decrease noise associated with pile driving for WTGs and other construction-related noise as compared to the Proposed Action, which are short-term **negligible** to **minor** adverse impacts. No measurable change from Proposed Action O&M impacts is anticipated because operational noise sources and levels would be the same: long-term **negligible** adverse impacts. Pile-driving and other construction noise and activity associated with Alternatives C through F could add to baseline noise and activity associated with other offshore wind projects with overlapping construction periods. Potential impacts could be greater if avoidance and displacement of birds occur during seasonal migration periods. However, Alternatives C through F's contribution would be limited in duration, negligible, and cease when construction ends. No individual fitness (i.e., a bird's ability to survive and reproduce) or population-level effects would be expected. Therefore, these alternatives when combined with past, present, and reasonably foreseeable activities would result in **negligible** to **minor** cumulative adverse impacts to birds.				**Offshore**: Similar to Alternatives C through F, Alternative G would slightly decrease noise associated with pile driving for WTGs and other construction-related noise impacts as compared to the Proposed Action, which are short-term **negligible** to **minor** adverse impacts. No measurable change from Proposed Action O&M impacts is anticipated because operational noise sources and levels would be the same: long-term **negligible** adverse impacts. Pile-driving and other construction noise and activity associated with Alternative G could add to baseline noise and activity associated with other offshore wind projects with overlapping construction periods. Potential impacts could be greater if avoidance and displacement of birds occur during seasonal migration periods. However, Alternative G's contribution would be limited in duration, negligible, and cease when construction ends. No individual fitness (i.e., a bird's ability to survive and reproduce) or population-level effects would be expected. Therefore, these alternatives when combined with past, present, and reasonably foreseeable activities would result in **negligible** to **minor** cumulative adverse impacts to birds.
		Onshore: Noise from traffic associated with construction and vegetation removal within the landfall work area and other onshore facilities could affect shorebirds, some seabirds, and land birds that use the terrestrial habitats in the immediate vicinity of construction activities through displacement or avoidance behavior of individuals and/or disruptions in communication, mating, and hunting. The impacts associated with construction would be similar to existing sources of noise and traffic in the local area and therefore are considered a temporary **negligible** adverse impact. Temporary noise and construction-related traffic may occasionally be generated due to nonroutine maintenance. Infrequent vehicle usage within the OnSS and ICF may create temporary noise-related disturbance to birds adjacent to the OnSS. However, such disturbance would be short term, and normal avian activity would likely resume after the traffic	**Onshore**: Alternatives C through F would not alter impacts to onshore activities; therefore, impacts would be the same as those described for the Proposed Action: temporary **negligible** adverse.				**Onshore**: Alternative G would not alter impacts to onshore activities; therefore, impacts would be the same as those described for the Proposed Action: temporary **negligible** adverse.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
		ceases. BOEM expects these adverse impacts to be **negligible**. In the context of reasonably foreseeable environmental trends, the combined impacts from this IPF from ongoing and planned actions, including the Proposed Action, would be localized and temporary due to the likely limited extent and duration of noise and would result in **negligible** adverse cumulative impacts to birds.					
Presence of structures	Onshore land development or port expansion activities could result in limited loss of nesting and/or foraging habitat for some bird species. The presence of offshore structures can lead to impacts, both beneficial and adverse, on birds through fish aggregation and the associated increase in foraging opportunities as well as entanglement and gear loss/damage, migration disturbances, and WTG strikes and displacement. These impacts may arise from buoys, met towers, foundations, scour/cable protections, and transmission cable infrastructure. Therefore, these impacts would be **minor** adverse.	**Offshore**: The various types of impacts on birds that could result from the presence of structures during construction include fish aggregation and an associated increase in foraging opportunities as well as entanglement and fishing gear loss/damage, migration disturbances, and displacement. These impacts would be temporary, and BOEM expects them to be **negligible** adverse. **Negligible** to **minor** temporary adverse impacts from bird collisions with visible structures could occur during construction, depending on the species and number of individuals involved. The primary impact to avian resources during operation would be collision with rotating turbine blades. The presence and operation of the offshore facilities may also result in displacement of waterbirds, waterfowl, seabirds, and phalaropes that use the area for foraging, resting, or nighttime roosting. Long-term adverse impacts would be **negligible** to **minor**, depending on whether birds are at high risk for collision and/or displacement or are able to access preferred habitat, and these impacts may change over time if birds become habituated to the presence of the WTGs and OSSs. Impacts to birds from decommissioning of the RWF and offshore RWEC would be similar to those described for the construction phase. The Project is not expected to affect special-status species populations. Cumulative impacts on birds from the presence of structures associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be long term **minor** adverse and long term **minor** beneficial.	**Offshore**: Alternatives C through F would reduce the number of WTGs, potentially resulting in a reduced amount of offshore construction equipment and vessels required. However, because bird exposure to vessels and installation infrastructure would be temporally limited to the construction period, the behavioral vulnerability to collision with construction equipment under Alternatives C through F is expected to be the same as described for the Proposed Action, which are **negligible** to **minor** temporary adverse impacts. During operations, Alternatives C through F would reduce the number of WTGs, potentially allowing for improved maneuverability for birds through the Lease Area and negligibly decreasing the risk of injury or mortality from collision with WTGs as compared to the Proposed Action, and impacts are expected to be long term **negligible** to **minor** adverse. Alternatives C through F would add 56 to 93 additional WTGs and up to two OSSs compared to the No Action Alternative. The total cumulative foundations on the Atlantic OCS would be 3,146 to 3,183, and the Project would account for less than 4% of that total number. Adverse impacts to migration patterns or collision risk from these additional turbines would be negligible and persist until decommissioning is complete. Additionally, beneficial impacts to foraging near offshore structures would similarly be negligible and persist for the life of the Project. Therefore, cumulative impacts on birds from the presence of structures associated with these alternatives when combined with past, present, and reasonably foreseeable activities would be long term **minor** adverse and long term **minor** beneficial.				**Offshore**: Similar to Alternatives C through F, Alternative G would reduce the number of WTGs and is expected to result in the same impacts as described for the Proposed Action, which are **negligible** to **minor** temporary adverse during construction and long term **negligible** to **minor** adverse during operations. Alternative G would add 65 WTGs and up to two OSSs compared to the No Action Alternative. The total cumulative foundations on the Atlantic OCS would be 3,155, and the Project would account for less than 3% of that total number. Adverse impacts to migration patterns or collision risk from these additional turbines would be negligible and persist until decommissioning is complete. Additionally, beneficial impacts to foraging near offshore structures would similarly be negligible and persist for the life of the Project. Therefore, cumulative impacts on birds from the presence of structures associated with these alternatives when combined with past, present, and reasonably foreseeable activities would be long term **minor** adverse and long term **minor** beneficial.
		Onshore: Impacts from habitat alteration and land disturbance on coastal and terrestrial bird habitats generated from the construction of the onshore facilities would create habitat loss and conversion,	**Onshore**: Alternatives C through F would not alter impacts to onshore activities; therefore, impacts would be the same as those described for the Proposed Action: temporary to long-term **negligible** to **minor** adverse.				**Onshore**: Alternative G would not alter impacts to onshore activities; therefore, impacts would be the same as those described for the Proposed Action: temporary to long-term

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
		affect bird habitat use, and possibly create habitat degradation. During the breeding season, clearing of trees or vegetation could result in destruction of nests, adversely impacting some individuals. However, lasting impacts to local breeding populations are not anticipated. Collisions between birds and vehicles or construction equipment have some limited potential to cause injury and mortality. Therefore, impacts to birds from construction of onshore facilities would be short term **negligible** to **minor** adverse. The OnSS and ICF would be visible structures that would result in permanent bird habitat conversion and loss. The OnSS access road and fenced-in property would become nonhabitat and result in habitat fragmentation. The conversion of forested cover type outside the OnSS and ICF fences would alter the structural diversity within a forested area by adding more edge habitat. Considering the adjacent landscape consists primarily of residential and commercial developments with some undisturbed areas of ruderal forested swamp, the adverse impacts to birds from the OnSS and the ICF on forested habitat fragmentation would be long term **negligible** to **minor**. The potential for avian mortality or injury due to the low risk of collision with the OnSS and related structures would be a long-term **minor** adverse impact. The potential for avian avoidance behavior related to habitat conversion and loss from the OnSS would also be a long-term **minor** adverse impact. Adverse impacts to birds from habitat fragmentation related to a visible change in the landscape during decommissioning would be **negligible** because local populations would have adapted to the landscape changes. The presence of these structures when considered in the context of ongoing and planned actions within the GAA would be a very minor risk of mortality or injury to birds due to collision, and generally, the changes to the habitat conditions would result in avoidance behavior and may influence bird habitat selection. Therefore, BOEM anticipates long-term **negligible** to **minor** adverse cumulative impacts to birds.					**negligible** to **minor** adverse.

3.7.2.2 Alternative A: Impacts of the No Action Alternative on Birds

3.7.2.2.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for birds (see Section 3.7.1) would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities and by permitted and constructed offshore wind COP projects within the GAA for birds. These IPFs are described and analyzed in Appendix E1.

3.7.2.2.2 Cumulative Impacts

This section discloses potential bird impacts associated with future offshore wind development (without the Proposed Action). The cumulative impact analysis for the No Action Alternative for planned non-offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E1.

<u>Accidental releases and discharges:</u> Future offshore wind and non-wind activities could expose coastal offshore waters to contaminants (e.g., fuel, sewage, solid waste, or chemicals, solvents, oils, or grease from equipment) in the event of a spill or release during routine vessel use. Ingestion of hard and soft plastic debris could lead to blockages and could result in adverse health effects to birds, such as decreased hematological function, dehydration, drowning, hypothermia, starvation, weight loss, and even death (Briggs et al. 1997; Haney et al. 2017; Paruk et al. 2016). Vessel compliance with USCG regulations would minimize trash or other debris; therefore, BOEM expects accidental trash releases from offshore wind vessels to be rare. Spills could result in small exposures that cause oiling of feathers that can lead to adverse effects such as changes in flight efficiencies and result in increased energy expenditure during daily and seasonal activities (Maggini et al. 2017). All future offshore wind projects would be required to comply with regulatory requirements related to the prevention and control of accidental spills administered by the USCG and BSEE. OSRPs are required for each project and would provide for rapid spill response, cleanup, and other measures that would help to minimize potential impacts on affected resources from spills. WTGs and OSSs are generally self-contained and would not generate discharge (see COP Appendix D). Vessels would also have onboard containment measures that would further reduce the impact of a spill in the event of an allision or collision. Based on the low risk of spills from vessels due to implementation of safe handling, storage, and cleanup procedures, impacts from accidental spills and trash would represent a **negligible** adverse impact to birds.

<u>Anchoring and new cable emplacement/maintenance:</u> Infrequent construction impacts associated with onshore power infrastructure would be required over the next 6 to 10 years to tie future offshore wind energy projects to the electric grid. Typically, this would require only small amounts of habitat removal, if any, and would occur primarily in previously disturbed areas. Up to 109,808 acres of localized temporary seafloor disturbance and associated increased suspended sedimentation could occur during construction of proposed wind farm cables and anchoring (see Table E-4 in Appendix E). Where future offshore wind activities overlap the GAA, there would be increased anchoring of vessels during survey activities and during the construction and installation, O&M, and decommissioning of offshore components. In addition, there could be increased anchoring/mooring of meteorological (met) towers or buoys. Disturbed seafloor from construction of future offshore wind projects and anchoring may affect diving birds' foraging success or may affect some prey species (e.g., benthic assemblages); however, impacts would be temporary and localized, and birds would be able to successfully forage in adjacent

areas and would not be affected by increased suspended sediments and no population-level impacts would occur. Suspended sediment concentrations during activities other than dredging would be within the range of natural variability for this location. Therefore, adverse impacts would be **minor**. See Sections 3.6 and 3.13 for detailed information on potential effects to benthic habitat.

Climate change: Impacts associated with climate change (i.e., increased storm severity and frequency, ocean acidification, altered migration patterns, increased disease frequency, habitat conversion, and increased erosion and sediment deposition) could result in long-term **minor** adverse risks to birds and could lead to changes in prey abundance and distribution, changes in nesting and foraging habitat abundance and distribution, and changes to migration patterns and timing. During construction, future offshore wind development activities may result in a small temporary increase in greenhouse gas (GHG) emissions (see Section 3.4.2.2.2). However, operation of these projects may beneficially contribute to a broader combination of actions to reduce future impacts to birds from climate change over the long term due to reduced reliance on fossil fuel–generated energy sources.

Light: Nighttime lighting associated with offshore structures and vessels could also represent a source of bird attraction. Under the No Action Alternative, offshore WTGs and OSSs would have hazard and aviation lighting that would be added beginning in 2021 and continuing through 2027 (see Table E1-3 in Appendix E1). Construction vessels are also a source of artificial lighting. Vessel lighting would be temporary and result in a **minor** adverse impact to birds; structure lighting may pose an increased collision or predation risk (Hüppop et al. 2006), although this risk would be localized in extent and minimized using BOEM lighting guidelines (BOEM 2021c; Kerlinger et al. 2010), and therefore would also be a **minor** adverse impact.

Noise: Table E-3 in Appendix E indicates that multiple offshore wind project construction periods are anticipated between 2022 and 2027. Construction noise sources will include, most notably, pile driving as well as geological and geophysical surveys, offshore and onshore construction, and aircraft and vessel traffic. These would create noise and may temporarily impact some bird species by displacing them and changing their behavior. Noise generated by construction equipment also has the potential to mask signals used by certain bird species for communication and mating, as well as hunting, which can lead to a decrease in bird density in the affected area (Bottalico et al. 2015). Potential impacts could be greater if avoidance and displacement of birds occur during seasonal migration periods. Noise transmitted through water could temporarily displace diving birds in a limited space around each pile and could cause short-term stress and behavioral changes ranging from mild annoyance to escape behavior (BOEM 2014b, 2016). Vessel and aircraft noise could also disturb some individual diving birds, but they would acclimate to the noise or move away, potentially resulting in temporary displacement. Collectively, these noise sources would be temporary and localized, resulting in a **minor** adverse impact to these birds.

Presence of structures: Onshore land development or port expansion activities could result in limited loss of nesting and/or foraging habitat for some bird species. The presence of offshore structures can lead to impacts, both beneficial and adverse, on birds through fish aggregation and the associated increase in foraging opportunities as well as entanglement and gear loss/damage, migration disturbances, and WTG strikes and displacement. These impacts may arise from buoys, met towers, foundations, scour/cable protections, and transmission cable infrastructure.

The primary threat to birds from the presence of structures would be from collision with WTGs. Birds are susceptible to collision with structures, particularly at night and/or during other periods of low visibility (e.g., rain or fog) (Stantec 2018). As discussed above, the Atlantic Flyway is an important migratory pathway for up to 164 species of waterbirds, and a similar number of land birds, with the greatest volume of birds using the Atlantic Flyway during annual migrations between wintering and breeding grounds (Watts 2010). As discussed in BOEM (2012), 55 bird species could encounter operating WTGs on the Atlantic OCS. However, the abundance of birds that overlap with the anticipated development of wind energy facilities on the Atlantic OCS is relatively small (Curtice et al. 2019; Winship et al. 2018). Of 55 bird species, 47 have sufficient survey data to calculate the modeled percentage of a species population that would overlap with the anticipated offshore wind development on the Atlantic OCS (Winship et al. 2018); the relative seasonal exposure is generally very low, ranging from 0.0% to 5.2% (Table 3.7-2). BOEM assumes that the 47 species (85%) with sufficient data to model the relative distribution and abundance are representative of the 55 species that may overlap offshore wind development on the Atlantic OCS.

Table 3.7-2. Percentage of Atlantic Seabird Populations that Overlap with Anticipated Offshore Wind Energy Development on the Outer Continental Shelf by Season

Species	Spring	Summer	Fall	Winter
Artic tern (*Sterna paradisaea*)	N/A	0.2%	N/A	N/A
Atlantic puffin (*Fratercula arctica*)	0.2%	0.1%	0.1%	0.2%
Audubon shearwater (*Puffinus lherminieri*)	0.0%	0.0%	0.0%	0.0%
Black-capped petrel (*Pterodroma hasitata*)	0.0%	0.0%	0.0%	0.0%
Black guillemot (*Cepphus grille*)	N/A	0.3%	N/A	N/A
Black-legged kittiwake (*Rissa tridactyla*)	0.7%	N/A	0.7%	0.5%
Black scoter (*Melanitta americana*)	0.2%	N/A	0.4%	0.5%
Bonaparte’s gull (*Chroicocephalus philadelphia*)	0.5%	N/A	0.4%	0.3%
Brown pelican (*Pelecanus occidentalis*)	0.1%	0.0%	0.0%	0.0%
Band-rumped storm-petrel (*Oceanodroma castro*)	N/A	0.0%	N/A	N/A
Bridled tern (*Onychoprion anaethetus*)	N/A	0.1%	0.1%	N/A
Common eider (*Somateria mollissima*)	0.3%	0.1%	0.5%	0.6%
Common loon (*Gavia immer*)	3.9%	1.0%	1.3%	2.1%
Common murre (*Uria aalge*)	0.4%	N/A	N/A	1.9%
Common tern (*Sterna hirundo*)	2.1%	3.0%	0.5%	N/A
Cory’s shearwater (*Calonectris borealis*)	0.1%	0.9%	0.3%	N/A
Double-crested cormorant (*Phalacrocorax auritus*)	0.7%	0.6%	0.5%	0.4%
Dovekie (*Alle alle*)	0.1%	0.1%	0.3%	0.2%
Great black-backed gull (*Larus marinus*)	1.3%	0.5%	0.7%	0.6%

Species	Spring	Summer	Fall	Winter
Great shearwater (*Puffinus gravis*)	0.1%	0.3%	0.3%	0.1%
Great skua (*Stercorarius skua*)	N/A	N/A	0.1%	N/A
Herring gull (*Larus argentatus*)	1.0%	1.3%	0.9%	0.5%
Horned grebe (*Podiceps auritus*)	N/A	N/A	N/A	0.3%
Laughing gull (*Leucophaeus atricilla*)	1.0%	3.6%	0.9%	0.1%
Leach's storm-petrel (*Oceanodroma leucorhoa*)	0.1%	0.0%	0.0%	N/A
Least tern (*Sternula antillarum*)	N/A	0.3%	0.0%	N/A
Long-tailed duck (*Clangula hyemalis*)	0.6%	0.0%	0.4%	0.5%
Manx shearwater (*Puffinus puffinus*)	0.0%	0.5%	0.1%	N/A
Northern fulmar (*Fulmarus glacialis*)	0.1%	0.2%	0.1%	0.2%
Northern gannet (*Morus bassanus*)	1.5%	0.4%	1.4%	1.4%
Parasitic jaeger (*Stercorarius parasiticus*)	0.4%	0.5%	0.4%	N/A
Pomarine jaeger (*Stercorarius pomarinus*)	0.1%	0.3%	0.2%	N/A
Razorbill (*Alca torda*)	5.2%	0.2%	0.4%	2.1%
Ring-billed gull (*Larus delawarensis*)	0.5%	0.5%	0.9%	0.5%
Red-breasted merganser (*Mergus serrator*)	0.5%	N/A	N/A	0.7%
Red phalarope (*Phalaropus fulicarius*)	0.4%	0.4%	0.2%	N/A
Red-necked phalarope (*Phalaropus lobatus*)	0.3%	0.3%	0.2%	N/A
Roseate tern (*Sterna* dougallii)	0.6%	0.0%	0.5%	N/A
Royal tern (*Thalasseus maximus*)	0.0%	0.2%	0.1%	N/A
Red-throated loon (*Gavia stellate*)	1.6%	N/A	0.5%	1.0%
Sooty shearwater (*Ardenna grisea*)	0.3%	0.4%	0.2%	N/A
Sooty tern (*Onychoprion fuscatus*)	0.0%	0.0%	N/A	N/A
South polar skua (*Stercorarius maccormicki*)	N/A	0.2%	0.1%	N/A
Surf scoter (*Melanitta perspicillata*)	1.2%	N/A	0.4%	0.5%
Thick-billed murre (*Uria lomvia*)	0.1%	N/A	N/A	0.1%
Wilson's storm-petrel (*Oceanites oceanicus*)	0.2%	0.9%	0.2%	N/A
White-winged scoter (*Melanitta deglandi*)	0.7%	N/A	0.2%	1.3%

Source: Calculated from Winship et al. (2018).

Notes: N/A = not applicable.

The primary operational impact to bird resources would be collision with WTGs. In the contiguous United States, bird collisions with operating WTGs are believed to be a relatively rare event, with an estimated 140,000 to 328,000 (mean = 234,000) birds killed annually by 44,577 onshore turbines (Loss et al. 2013). Robinson Willmott et al. (2013) evaluated the sensitivity of bird resources to collision and/or displacement due to future wind development on the Atlantic OCS and included the 164 species selected by Watts (2010) plus an additional 13 species, for a total of 177 species that may occur on the Atlantic OCS from Maine to Florida during all or some portion of the year. As discussed in Robinson Willmott et al. (2013), species populations with high scores for sensitivity for collision include gulls, jaegers, and the northern gannet (*Morus bassanus*). In many cases, high collision sensitivity was driven by high occurrence on the Atlantic OCS, low avoidance rates with high uncertainty, and time spent in the RSZ. Many of the species addressed in Robinson Willmott et al. (2013) that had low collision sensitivity include migrating passerines that typically fly above the RSZ. As discussed in BOEM (2012), 55 species may be expected to have some level of potential overlap with the WEA and could encounter operating WTGs on the Atlantic OCS. However, generally the abundance of bird species that overlap with the anticipated development of wind energy facilities on the Atlantic OCS is relatively small. As described above, of the 177 species that may occur along the Atlantic coast, 55 are likely to encounter WTGs associated with offshore wind development. Of these, there are a total of 47 marine bird species with sufficient survey data to calculate the modeled percentage of a species population that would overlap with the anticipated offshore wind development on the Atlantic OCS (Winship et al. 2018); the relative seasonal exposure is generally very low, ranging from 0.0% to 5.2% (see Table 3.7-2). BOEM assumes that the 47 species (85%) with sufficient data to model the relative distribution and abundance on the Atlantic OCS are representative of the 55 species that may overlap with offshore wind development on the Atlantic OCS.

It is generally assumed that inclement weather and reduced visibility causes changes to migration altitudes and could potentially lead to large-scale mortality events (BOEM 2021a). However, this has not been shown to be the case in studies of offshore wind facilities in Europe, with oversea migration completely, or nearly so, ceasing during inclement weather (Fox et al. 2006; Hüppop et al. 2006) and with migrating birds avoiding flying through fog and low clouds (Panuccio et al. 2019). Further, many of these passerine species, while detected on the OCS during migration as part of BOEM's Acoustic/Thermographic Offshore Monitoring project (Robinson Willmott and Forcey 2014), were documented in relatively low numbers. In addition, most of the activity (including blackpoll warblers) was during windspeeds less than 10 kilometers per hour—below the turbine cut-in speed (see Figure 109 in Robinson Willmott and Forcey 2014) and therefore pose little risk to migrating passerines.

During migration, many bird species, including songbirds, are likely to fly at heights well above the RSZ (89 to 696 feet [27 to 212 m] above sea level) (BOEM 2021a). As shown in Robinson Willmott et al. (2013), species with low sensitivity scores include many passerines that only cross the Atlantic OCS briefly during migration and typically fly well above the RSZ. Additionally, with the proposed 1-nm (1.9-km) spacing between structures associated with future offshore wind development and the distribution of anticipated projects, only a small percentage of bird species migrating over the Atlantic OCS would encounter WTGs, with most flying above or below spinning turbines. Further, the spacing between turbines would likely permit birds to fly through individual lease areas without changing course or only making minor course corrections to avoid operating WTGs. Course corrections made to avoid a wind energy facility could result in exposure to one or more additional wind energy facilities within the GAA, but again, the 1-nm spacing would allow for migrating individuals to make only small course correction, if any, to avoid operating WTGs. Course corrections made by migratory birds to avoid a project or individual WTG would be relatively minor when compared to the distances traveled during seasonal long-distance migrations. Adverse impacts of additional energy expenditure due to minor course corrections or complete avoidance of lease areas would not be expected to be biologically significant, and no population-level effects would be expected. Therefore, these adverse impacts would be **minor**.

The addition of WTGs to the offshore environment could result in increased functional loss of habitat for those bird species with higher displacement sensitivity. However, substantial foraging habitat for resident birds would remain available. Further, a recent study of long-term data collected in the North Sea found that despite the extensive observed displacement of loons in response to the development of 20 wind farms, there was no decline in the region's loon population (Vilela et al. 2021).

The presence of new structures could result in increased prey items for some marine bird species. WTG foundations could increase the mixing of surface waters and deepen the thermocline, possibly increasing pelagic productivity in local areas (English et al. 2017). The new structures may also create habitat for structure-oriented and/or hard-bottom species. This reef effect has been observed around WTGs, leading to local increases in biomass and diversity (Causon and Gill 2018). Invertebrate and fish assemblages may develop around these reef-like elements within the first year or two after construction (English et al. 2017). Although some studies have noted increased biomass and increased production of particulate organic matter by epifauna growing on submerged foundations, it is not clear to what extent the reef effect results in increased productivity versus simply attracting and aggregating fish from the surrounding areas (Causon and Gill 2018). Recent studies have found increased biomass for benthic fish and invertebrates, and possibly for pelagic fish, marine mammals, and birds as well (Pezy et al. 2018; Raoux et al. 2017; Wang et al. 2019), indicating that offshore wind energy facilities can generate beneficial permanent impacts on local ecosystems, translating to increased foraging opportunities for individuals of some marine bird species. BOEM anticipates that the presence of structures may result in permanent beneficial impacts. Conversely, increased foraging opportunities could attract marine birds, potentially exposing those individuals to increased collision risk associated with operating WTGs. Therefore, these impacts would be **minor** adverse.

3.7.2.2.3 Conclusions

Under the No Action Alternative, birds would continue to follow the current general trends and respond to current and future environmental and societal activities. Although the Project would not be built as proposed under the No Action Alternative, ongoing activities (e.g., commercial fisheries) and future offshore wind development would continue to have temporary to permanent adverse impacts (e.g., disturbance, displacement, injury, mortality, habitat degradation, habitat conversion) on birds primarily through accidental releases, anthropogenic noise, traffic, presence of structures, and climate change. In addition to ongoing activities, the impacts of planned actions other than offshore wind development, including new submarine cables and pipelines, increasing onshore construction, marine minerals extraction, port expansions, and the installation of new structures on the Atlantic OCS, would be **minor** adverse. The combination of ongoing activities and reasonably foreseeable activities other than offshore wind would result in **minor** adverse impacts on birds in the GAA.

Considering all the IPFs together, the overall impacts associated with offshore wind activities in the GAA would result in **minor** adverse impacts to birds. Most of the offshore structures in the GAA would be attributable to offshore wind development. Migratory birds that use the offshore WEAs during all or parts of the year would either be exposed to new collision risk or would have long-term functional habitat loss due to behavioral avoidance and displacement from WEAs on the Atlantic OCS. The offshore wind development would also be responsible for most of the impacts related to new cable emplacement and pile-driving noise, but impacts on birds resulting from these IPFs would be localized and temporary and would not be biologically significant.

The No Action Alternative would forgo postconstruction avian monitoring for migratory birds and ESA-listed species and annual mortality reporting, the results of which could contribute to an improved understanding of the effects of offshore wind development, benefit the future management of these species, and inform planning of other offshore development. However, ongoing and future surveys and monitoring could still supply similar data.

3.7.2.3 Alternative B: Impacts of the Proposed Action on Birds

3.7.2.3.1 Construction and Installation

Offshore Activities and Facilities

Accidental releases and discharges: Some potential for mortality, decreased fitness, and health effects exists due to the accidental release of fuel, hazmat, and trash and debris from vessels associated with construction and installation of the Proposed Action. Vessels associated with the Proposed Action may generate operational waste, including bilge and ballast water, sanitary and domestic wastes, and trash and debris. All vessels associated with the Proposed Action would comply with USCG requirements and BSEE regulations for the prevention and control of oil and fuel spills. Potential adverse impacts to birds from contaminant discharges or releases or from improper disposal of trash or debris during construction would be avoided or minimized with adherence to federal, state, and local regulations regarding disposal of solid and liquid wastes, resulting in short-term **negligible** to **minor** adverse impacts. Accidental spills or releases of oils or other hazardous materials offshore would be managed through the OSRP (see COP Appendix D [Orsted 2023]). Additionally, training and awareness of BMPs proposed for waste management and mitigation of marine debris would be required of Project personnel, reducing the likelihood of occurrence to a very low risk. These accidental releases, if any, would occur infrequently at discrete locations and vary widely in space and time; for this reason, BOEM expects localized and temporary **negligible** adverse impacts on birds.

Anchoring and new cable emplacement/maintenance: Construction of the WTG foundations and the installation of the submarine cables could result in short-term habitat disturbance for foraging birds. Seafloor disturbed by cable installation and dredging prior to cable installation would result in turbidity effects that could reduce marine bird foraging success or have temporary and localized impacts on marine bird prey species. These impacts would be temporary, lasting up to 12 hours, and localized to the emplacement corridor. Vessel anchoring during construction would also result in increased turbidity. Individual birds would successfully forage in nearby areas not affected by increased turbidity/sedimentation during anchoring and cable emplacement, and only nonmeasurable **negligible** adverse impacts, if any, on individuals or populations would be expected given the localized and temporary nature of construction activities.

Climate change: Construction of the offshore facilities would result in a small temporary increase in GHG emissions within the GAA during the construction phase. However, these emissions could be reduced by staggering construction time frames and implementing applicant-proposed EPMs (see Table G-1 in

Appendix G). As a result, adverse impacts to birds from construction of the Proposed Action associated with climate change would be short term **negligible** adverse.

Light: Lighting used during construction would be limited to the minimum required for safety during construction activities to minimize potential impacts. Therefore, adverse impacts to birds from lighting during construction would be localized and temporary **negligible** to **minor** adverse.

Noise: **Negligible** to **minor** adverse impacts to birds would occur from construction noise related to pile driving as well as geological and geophysical surveys and aircraft and vessel traffic. These activities could flush birds in the path of vessels, causing temporary displacement from the area. However, these impacts would be temporary and similar to baseline conditions as vessel traffic already occurs, resulting in similar temporary displacement of birds in the GAA (Stantec 2018). These impacts could be greater if avoidance and displacement of birds occur during seasonal migration periods. As described in Section 4.1.2.2 of the BA (BOEM 2022), underwater noise from monopile installation would be unlikely to measurably affect prey availability for birds.

Presence of structures: The various types of impacts on birds that could result from the presence of structures during construction include fish aggregation and an associated increase in foraging opportunities as well as entanglement and fishing gear loss/damage, migration disturbances, and displacement. These impacts would be temporary, and BOEM expects them to be **negligible** adverse. **Negligible** to **minor** temporary adverse impacts from bird collisions with visible structures could occur during construction, depending on the species and number of individuals involved.

Onshore Activities and Facilities

Accidental releases and discharges: Onshore, construction and HDD activities could result in the accidental releases of fuel, fluids, or hazmat; sediment; and/or trash and debris. These releases, if any, would occur infrequently at discrete locations and vary widely in space and time. Revolution Wind would prepare a construction SPCC plan in accordance with applicable requirements and would outline spill prevention training, plans, and steps to take to contain and clean up spills that could occur. Based on the low risk of spills due to implementation of safe handling, storage, and cleanup procedures, impacts from accidental spills and trash would represent a localized and temporary **negligible** adverse impact to birds.

Climate change: Onshore impacts to birds associated with climate change from construction of the Proposed Action would be similar to those discussed above for offshore facilities and activities: short term **negligible** adverse.

Light: Most of the onshore construction would occur during the daylight hours, although some overnight lighting may occasionally be necessary during construction of the onshore facilities. However, this is not expected to have a measurable effect on bird behavior, therefore BOEM anticipates temporary **negligible** adverse impacts to birds.

New cable emplacement/maintenance: Land disturbance and habitat alteration resulting from construction within the landfall work area may result in the direct injury or mortality of bird species. Mobile individuals would be able to temporarily vacate an area of disturbance and therefore would be less susceptible to mortality or injury compared to less mobile (pre-volant) individuals. Mitigations like observing time-of-year restrictions on vegetation removal would avoid the breeding season of birds, thus reducing the likelihood of injury and/or mortality from construction activities. Therefore, the impacts (e.g., injury and/or mortality) resulting from land disturbance and habitat alteration would be temporary **negligible** adverse. Further, HDD would be employed to make the connection between the onshore transmission cable and the landfall work area, which would limit or completely avoid impacts to the human-made shoreline and the ruderal grassland/shrubland because the onshore transmission cable would be installed under these resources. Because construction work within the landfall work area would occur largely outside of the breeding period of listed species that might nest in the area, and because use of the shoreline by shorebirds within the landfall work area has not been documented (VHB 2023), onshore impacts for listed species from land disturbance would be **negligible** adverse. A detailed impacts analysis to federally listed birds from construction activities is in the USFWS BA (BOEM 2022, 2023a).

The temporary onshore construction work area for HDD operations would likely be situated within a previously developed area (e.g., an existing parking lot) and would not impact the human-made shoreline and/or the ruderal grassland/shrubland. Because the landfall work area is limited to anthropogenically made or disturbed features of the human-made shoreline and the ruderal grassland/shrubland, the potential for land disturbance and habitat alteration to significantly affect birds is **negligible** adverse. Additional land disturbance and habitat alteration would result from the installation of the onshore transmission cable from the transition joint bays to the OnSS. The onshore transmission cable installation would result in temporary ground disturbance. Most of the temporary ground disturbance would occur in previously disturbed areas along paved roads or parking lots and would not result in impacts to bird habitat.

Onshore transmission cable installation would also result in temporary ground disturbance. Most of the temporary ground disturbance would occur in previously disturbed areas along paved roads or parking lots and would not result in impacts to bird habitat.

<u>Noise:</u> Noise from traffic associated with construction and vegetation removal within the landfall work area and other onshore facilities could affect shorebirds, some seabirds, and land birds that use the terrestrial habitats in the immediate vicinity of construction activities through displacement or avoidance behavior of individuals and/or disruptions in communication, mating, and hunting. Displacement and avoidance behavior are expected to only occur during construction, which would occur primarily in already developed areas where birds are habituated to these types of activities. The impacts associated with construction would be similar to existing sources of noise and traffic in the local area and therefore are considered a temporary **negligible** adverse impact.

<u>Presence of structures:</u> Impacts from habitat alteration and land disturbance on coastal and terrestrial bird habitats generated from the construction of the onshore facilities would create habitat loss and conversion, affect bird habitat use, and possibly create habitat degradation. The OnSS and ICF parcels include ruderal forested swamp, shrub marsh, ruderal mixed oak/white pine forest, ruderal pitch pine barren, and a landfill. Vegetation clearing and ongoing vegetation management would convert some of these cover types to permanently developed land or shrubland within the areas that would undergo vegetation maintenance. This habitat conversion may be detrimental to species reliant on forest habitat but beneficial to other species that are more suited to the newly converted habitat (e.g., passerines adapted to grassland and shrubland). The OnSS would result in a permanent loss of 3.8 acres of mixed oak/white pine forest and 0.6 acre of ruderal pitch pine barren. However, the portion of forested habitat removal would be small relative to the available forested habitat in the surrounding area. During the breeding season, clearing of trees or vegetation could result in destruction of nests, adversely impacting some individuals. However, lasting impacts to local breeding populations are not anticipated. Tree and shrub removal work would

occur before May 1 and after August 15, as feasible (see COP Table ES-1), to avoid the potential disturbance of birds during the breeding season. If tree and shrub removal cannot be avoided during this season, Revolution Wind would coordinate with the appropriate agencies to determine the appropriate course of action. Visible structures (i.e., construction equipment) would be present during construction of the onshore facilities. Collisions between birds and vehicles or construction equipment have some limited potential to cause injury and mortality. However, these impacts, if any, would be temporary **negligible** adverse, as most individuals would avoid noisy construction areas (Bayne et al. 2008; Goodwin and Shriver 2010; McLaughlin and Kunc 2013). Therefore, impacts to birds from construction of onshore facilities would be short term **negligible** to **minor** adverse.

3.7.2.3.2 Operations and Maintenance and Decommissioning

Offshore Activities and Facilities

Accidental releases and discharges: Impacts to birds from this IPF during operation and decommissioning of the offshore facilities are expected would be similar to offshore construction impacts and result in short-term **negligible** to **minor** adverse impacts with compliance with the USCG requirements and BSEE regulations for the prevention and control of oil and fuel spills and adherence to federal, state, and local regulations regarding disposal of solid and liquid wastes.

Anchoring and new cable emplacement/maintenance: Other than temporary increases in turbidity from seafloor disturbance due to occasional vessel anchoring, no impacts to bird species are anticipated during the O&M phase for the offshore RWF or RWEC. Impacts from decommissioning would be similar to construction impacts unless the RWEC is abandoned in place: **negligible** adverse.

Climate change: The expected impacts on climate change from operation of the offshore facilities alone would not result in a measurable increase in the adverse impacts to birds beyond those described under the No Action Alternative. In addition, operation of the Proposed Action could also contribute to a long-term net decrease in GHG emissions and may beneficially contribute to a broader combination of actions to reduce future impacts to birds from climate change over the long term due to reduced reliance on fossil fuel–generated energy sources, but this change would likely not be measurable. Therefore, BOEM expects the impacts from the Proposed Action on climate change would be long term **negligible**.

Light: Under the Proposed Action, up to 100 WTGs and up to two OSSs would be lit with USCG navigational and FAA hazard lighting. These lights have some potential to attract birds and result in increased collision risk (Hüppop et al. 2006). However, the mandatory use of red flashing aviation obstruction lights, the avoidance of any steady-burning aviation obstruction lights, and the use of ADLS (see Table F-2 in Appendix F for details) are expected to minimize bird attraction and therefore collision risk (Kerlinger et al. 2010; Orr et al. 2016). For this reason, BOEM expects adverse impacts, if any, to be long term **negligible** adverse from offshore lighting.

Noise: Impacts to birds from operational noise and decommissioning of the offshore facilities would be similar to offshore construction impacts and result in **negligible** adverse impacts.

Presence of structures: Within the Atlantic Flyway along the North American Atlantic coast, much of the bird activity is concentrated along the coastline (Watts 2010). Waterbirds use a corridor between the coast and several kilometers out onto the Atlantic OCS, whereas land birds tend to use a wider corridor extending from the coastline to tens of kilometers inland (Watts 2010). However, operation of the

Proposed Action would result in impacts on some individuals of offshore bird species and possibly some individuals of coastal and inland bird species during spring and fall migration. These impacts could arise through direct mortality from collisions with WTGs and/or through behavioral avoidance and habitat loss (Drewitt and Langston 2006; Fox et al. 2006; Goodale and Millman 2016). To reduce the collision risk with WTGs, Revolution Wind is committed to an indicative layout scenario with WTGs sited in a grid with a spacing of approximately 1.15 miles (1 nm) × 1.15 miles (1 nm) that aligns with other proposed adjacent offshore wind projects in the RI/MA WEA. This wide spacing of WTGs is expected to allow birds to avoid individual WTGs and minimize risk of potential collision (see COP Table ES-1).

In COP Appendix AA (BRI 2023), vulnerability was assessed to determine how sensitive a bird population is to mortality or habitat loss related to the presence of a wind farm and in terms of collision vulnerability and displacement vulnerability. Factors considered in vulnerability assessments include vital rates, existing population trends, relative abundance, nocturnal flight activity, diurnal flight activity, avoidance, proportion of time within the RSZ, maneuverability in flight, percentage of time flying, and habitat flexibility. Avian flight heights were important in the assessment of behavioral vulnerability. Flight heights used in the assessment were gathered from OSAMP boat-based surveys (local) and datasets in the Northwest Atlantic Seabird Catalog (regional). Final exposure and vulnerability assessments for each taxonomic group and species are provided in Sections 3.4 through 3.10 of COP Appendix AA (BRI 2023) and in Table 3-38 of COP Appendix AA (BRI 2023).

The presence and operation of the offshore facilities may result in displacement of waterbirds, waterfowl, seabirds, and phalaropes that use the area for foraging, resting, or nighttime roosting. Some species can be displaced several kilometers outside the Lease Area (Welcker and Nehls 2016). Generally, the relative abundance of bird species that are most sensitive to displacement is low within the offshore portion of the Project during all seasons (BRI 2023). These long-term adverse impacts would be **negligible** to **minor**, depending on whether birds are at high risk for displacement or are able to access preferred habitat, and these impacts may change over time if birds become habituated to the presence of the WTGs and OSSs. Impacts to birds from decommissioning of the RWF and offshore RWEC would be similar to those described for the construction phase.

The Lease Area is generally beyond the range of most breeding terrestrial or coastal bird species. Coastal birds that may forage in the Lease Area occasionally, visit the area sporadically, or pass through on their spring and/or fall migrations include shorebirds (e.g., sandpipers, plovers), waterbirds (e.g., cormorants, grebes), waterfowl (e.g., scoters, mergansers), wading birds (e.g., herons, egrets), raptors (e.g., falcons, eagles), and songbirds (e.g., warblers, sparrows). Overall, with the exception of migratory falcons and songbirds, coastal birds are considered to have minimal exposure to the Lease Area. Falcons, primarily peregrine falcons, may be exposed to the Lease Area. Some migratory songbirds, particularly the blackpoll warbler, may also be exposed to the Lease Area during fall migration, but population-level impacts are unlikely because exposure of the population to the Lease Area is expected to be minimal to low and limited to migration. Of the marine birds, loons, sea ducks, gulls, terns, and auks received up to a medium overall exposure assessment. Loons, sea ducks, gannets, and auks are documented to avoid wind farms, but displacement from the Lease Area is unlikely to affect populations because there is likely available foraging habitat outside the Lease Area (BRI 2023).

Special-status bird species were also assessed, including golden eagle, bald eagle, red knot, piping plover, and roseate tern. The Project is not expected to affect special-status species populations. Golden and bald eagle exposure to the Lease Area is considered minimal because these species are rarely detected in the offshore environment. Red knots and piping plovers have the potential to be exposed only during migration, and vulnerability to collision is considered low because shorebirds fly substantially above the RSZ during migrations. Although tracked roseate terns were estimated to have passed through the northern portion of the Lease Area (BRI 2023), individual impacts are unlikely because the birds were not detected in the Lease Area during surveys, and they would be primarily flying below the RSZ. A detailed analysis of the impacts from O&M and decommissioning of the offshore facilities on federally listed birds can be found in the BA (BOEM 2022, 2023a).

Onshore Activities and Facilities

Accidental releases and discharges: The OnSS would require various oils, fuels, and lubricants to support its operation. As described above in Section 3.7.2.2.1, accidental discharges, releases, and disposal could indirectly cause bird habitat degradation; however, risks would be avoided through spill prevention and control measures and associated BMPs. Therefore, potential adverse impacts associated with discharges and releases are considered short term and localized **negligible** adverse.

Climate change: No measurable climate change impacts to birds from O&M of the onshore facilities are expected. Climate change impacts from decommissioning would be similar to those described for construction. Therefore, the adverse impacts from this IPF are expected to be long term **negligible** adverse.

Light: During the O&M of the OnSS and ICF, yard lighting would be used for assessment of equipment. In general, operational lighting would be limited to the minimum necessary to ensure safety and compliance with applicable regulations (see COP Table ES-1). Most decommissioning activities would occur during the day, and overnight lighting would only be necessary if there is work in progress on-site or lights are left on for safety and security purposes. Therefore, the adverse impacts resulting from this IPF would be long term **negligible**.

New cable emplacement/maintenance: Operation of the onshore transmission cable would pose no risk to birds because it would be buried. Land disturbance in the form of vegetation management would occur on a periodic basis to maintain vegetation at shrub height within the perimeters of the onshore facilities. Hazard tree removal would be performed on a cyclical basis to inspect and remove trees that may fail that are outside the edge of the maintained ROW. Land disturbance as it relates to vegetation clearing may result in the direct injury or mortality of birds. However, mortality and injury impacts would be mitigated by observing time-of-year restrictions on vegetation removal that would avoid the breeding season of bird species. Therefore, the adverse impacts resulting from this IPF would be **negligible**. Impacts from land disturbance during decommissioning would be similar to those described in Section 3.7.2.2.1, though the impacts would likely be less because new vegetation clearing, and grading would not be necessary.

Noise: According to the VHB (2023) onshore acoustic assessment, during O&M, the proposed OnSS and ICF would introduce new sources of sound, which is modeled to be 45.5 dBA (Leq) or less when measured at the nearest anthropogenic sensitive receptors and falls within the ambient sound range measured at baseline conditions. Temporary noise and construction-related traffic may occasionally be generated due to nonroutine maintenance. Pickup trucks or other automobiles would be used to make routine visits to the OnSS and ICF during O&M. Occasional maintenance and operational emergency visits may necessitate bucket trucks, cranes, and similar vehicles to facilitate these activities. Infrequent vehicle usage within the OnSS and ICF may create temporary noise-related disturbance to birds adjacent to the OnSS. However, such disturbance would be short term, and normal avian activity would likely resume after the traffic ceases. BOEM expects these adverse impacts to be **negligible**.

Presence of structures: The OnSS and ICF would be visible structures that would result in permanent bird habitat conversion and loss. The OnSS access road and fenced-in property would become nonhabitat and result in habitat fragmentation. The conversion of forested cover type outside the OnSS and ICF fences would alter the structural diversity within a forested area by adding more edge habitat. Considering the adjacent landscape consists primarily of residential and commercial developments with some undisturbed areas of ruderal forested swamp, the adverse impacts to birds from the OnSS and the ICF on forested habitat fragmentation would be long term **negligible** to **minor**.

This change in the visible landscape would present a very minor risk of mortality or injury to birds due to collision with the OnSS or ICF, and, generally, the changes to the habitat conditions would result in avoidance behavior and may influence bird habitat selection near these structures (e.g., breeding habitat for some forest-dependent species may be less suitable). These impact risks would exist throughout the O&M phase of the Project. The potential for avian mortality or injury due to the low risk of collision with the OnSS and related structures would be a long-term **minor** adverse impact. The potential for avian avoidance behavior related to habitat conversion and loss from the OnSS would also be a long-term **minor** adverse impact. If the footprint of the OnSS and ICF yards are left in place after they have been decommissioned and equipment has been removed, the remaining development would still be considered a visible structure because it would remain a hard structure within a forested area. Adverse impacts to birds from habitat fragmentation related to a visible change in the landscape during decommissioning would be **negligible** because local populations would have adapted to the landscape changes.

3.7.2.3.3 Cumulative Impacts

Offshore Activities and Facilities

Accidental releases and discharges: Future offshore wind activities would contribute to an increased risk of spills and associated impacts due to fuel, fluid, or hazmat exposure. The contribution from future offshore wind and the Proposed Action would be a low and non-measurable percentage of the overall spill risk from all ongoing offshore activities. In the context of reasonably foreseeable environmental trends, the combined impacts from this IPF from ongoing and planned actions, including the Proposed Action, would be likely limited in extent and duration and would result in localized and temporary **negligible** adverse cumulative impacts on birds.

Anchoring and new cable emplacement/maintenance: The Proposed Action would add 7,213 acres of seafloor disturbance from RWEC and IAC installation and anchoring to the No Action Alternative, which equates to 7% of the total seafloor disturbance estimated under the No Action Alternative. This would result in localized turbidity effects that could reduce marine bird foraging success or impact marine bird prey species. However, individual birds would be expected to successfully forage in nearby areas not affected by increased turbidity, and only non-measurable **negligible** adverse impacts, if any, on individuals or populations would be expected given the localized and temporary nature of the potential impacts. In the context of reasonably foreseeable environmental trends, the combined cable emplacement impacts from ongoing and planned actions, including the Proposed Action, could occur if impacts are in close temporal and spatial proximity. However, these adverse impacts from anchoring and cable emplacement would be **negligible** and would not be biologically significant. For these reasons, the Proposed Action when combined with other past, present, and reasonably foreseeable projects would result in short-term **negligible** to **minor** cumulative adverse impacts to birds.

<u>Climate change:</u> The types of impacts from global climate change described for the No Action Alternative would occur under the Proposed Action. However, the Proposed Action could also contribute to a long-term net decrease in GHG emissions. This difference may not be measurable but would help reduce climate change impacts. Therefore, long-term **minor** adverse and long-term **negligible** beneficial cumulative impacts to birds are expected.

<u>Light:</u> The Proposed Action would add up to 100 new WTGs with red flashing aviation hazard lighting to the No Action Alternative; these lights could attract birds and result in increased collision risk (Hüppop et al. 2006). Additionally, marine navigation lighting would include one or more flashing white lights on each WTG and the OSSs and would be directed out and down to the water surface. Vessel lights during construction and installation, O&M, and decommissioning would be minimal and limited to vessels transiting to and from wind farm areas. Ongoing and future non–offshore wind activities are expected to cause short-term impacts, primarily from vessel lights. For these reasons, the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in long-term **negligible** to **minor** adverse cumulative impacts to birds, and no individual or population-level impacts would be expected.

<u>Noise:</u> Pile-driving and other construction noise and activity associated with the Proposed Action could add to baseline noise and activity associated with other offshore wind projects with overlapping construction periods. Potential impacts could be greater if avoidance and displacement of birds occur during seasonal migration periods. However, the Proposed Action's contribution to adverse noise impacts would be limited in duration, negligible, and cease when construction ends. No individual fitness (i.e., a bird's ability to survive and reproduce) or population-level effects would be expected. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **negligible** to **minor** adverse cumulative impacts to birds.

<u>Presence of structures:</u> The Proposed Action would add up to 100 additional WTGs and up to two OSSs compared to the No Action Alternative. The total cumulative foundations on the Atlantic OCS would be 3,190, and the Project would account for less than 4% of that total number. Adverse impacts to migration patterns or collision risk from these additional turbines would be negligible and would persist until decommissioning is complete. Additionally, beneficial impacts to foraging near offshore structures would similarly be negligible and persist for the life of the Project. Therefore, cumulative impacts on birds from the presence of structures associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be long term **minor** adverse and long term **minor** beneficial.

Onshore Activities and Facilities

<u>Accidental releases and discharges:</u> Onshore construction activities and operation of the OnSS under the Proposed Action could result in the accidental releases of fuel, fluids, or hazmat; sediment; and/or trash and debris. These releases, if any, would occur infrequently at discrete locations and vary widely in space and time. Ongoing and future onshore activities could contribute to impacts to birds from accidental releases if they occur at the same time within the GAA. However, incidences such as these would be mitigated by implementation of project-specific SPCC plans. In the context of reasonably foreseeable

environmental trends, the combined impacts from this IPF from ongoing and planned actions, including the Proposed Action, would be localized and temporary due to the likely limited extent and duration of a release and result in **negligible** adverse cumulative impacts to birds.

<u>Climate change:</u> The types of impacts from global climate change described for the No Action Alternative would occur under the Proposed Action, but no measurable change from the operational impacts of onshore activities and facilities to birds under the No Action Alternative is anticipated. Therefore, the combined impacts from this IPF from ongoing and planned actions, including the Proposed Action and cumulative impacts, are expected to be long term **minor** adverse.

<u>Light:</u> Lighting used during construction of the Proposed Action would be limited to the minimum required for safety. Operational lighting would be limited to the minimum necessary to ensure safety and compliance with applicable regulations (see COP Table ES-1). Decommissioning activities would primarily occur during the day, and overnight lighting is not expected. Therefore, impacts to birds from the Proposed Action would be localized and temporary **negligible** to **minor** adverse. Ongoing and future onshore activities could contribute to impacts to birds from light if they occur at the same time within the GAA. However, these effects are also expected to be localized and temporary and would not contribute to adverse cumulative impacts to birds in the GAA.

<u>New cable emplacement/maintenance:</u> The Proposed Action would result in temporary ground disturbance from installation of the onshore transmission cable and construction at the landfall work area. Most of this temporary ground disturbance would occur in previously disturbed areas along paved roads or parking lots and would not result in impacts to bird habitat. Operation of the onshore transmission cable would pose no risk to birds because it would be buried, and no other impacts to bird species are anticipated during routine onshore operations. Therefore, the contribution of the Proposed Action on adverse cumulative impacts to birds from new cable emplacement or maintenance in the context of reasonably foreseeable onshore environmental trends within the GAA is expected to be **negligible** adverse.

<u>Noise:</u> Onshore construction activities would add to onshore noise, resulting in localized and temporary impacts to birds (i.e., avoidance and displacement), particularly if ongoing and planned onshore activities overlap with the Proposed Action in space and time. Normal operation of the OnSS would generate continuous noise. However, BOEM expects long-term **negligible** adverse impacts when considered in the context of the other commercial and industrial noises nearby. Therefore, in the context of reasonably foreseeable environmental trends, the combined impacts from this IPF from ongoing and planned actions, including the Proposed Action, would be localized and temporary due to the likely limited extent and duration of noise and would result in **negligible** adverse cumulative impacts to birds.

<u>Presence of structures:</u> The Proposed Action would result in the permanent conversion, loss, and fragmentation of onshore bird habitat through the removal of forested cover types for construction of the OnSS and the ICF. These actions could result in localized and temporary impacts to birds, including avoidance and displacement, although no individual fitness or population-level effects would be expected. These changes would have a **negligible** adverse effect on birds because forested habitat is common within the surrounding area. In addition, the permanent onshore facilities (ICF and OnSS) would be located on the edge of previously developed areas. The presence of these structures when considered in the context of ongoing and planned actions within the GAA would be a very minor risk of mortality or injury to birds due to collision, and generally, the changes to the habitat conditions would result in avoidance behavior

and may influence bird habitat selection. Therefore, BOEM anticipates long-term **negligible** to **minor** adverse cumulative impacts to birds.

3.7.2.3.4 Conclusions

Project construction and installation and decommissioning would introduce noise, lighting, human activity, debris and contaminants, and new structures and vessels (increasing potential collision risk) to the GAA as well as alter existing bird habitat. Noise, lighting, and human activity impacts from Project O&M would occur, although at lower levels than those produced during construction and decommissioning. Offshore structures would also represent a long-term collision risk. BOEM anticipates the impacts resulting from the Proposed Action alone would range from **negligible** to **minor** adverse for the duration of the Project. Therefore, BOEM expects the overall impact on birds from the Proposed Action alone to be long term **minor** adverse; however, the resource would recover completely after decommissioning without remedial or mitigating action.

In the context with other reasonably foreseeable environmental trends and planned actions, the impacts under the Proposed Action resulting from individual IPFs would range from temporary to long term **negligible** to **minor** adverse as well as long term **negligible** beneficial. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **minor** cumulative adverse impacts to birds. This determination is because the impacts would not be expected to result in noticeable change to the condition of birds in the GAA, and the populations would recover completely without remedial or mitigating action.

3.7.2.4 Alternatives C, D, E, and F

Table 3.7-1 provides an analysis of all evaluated IPFs for birds across these alternatives.

3.7.2.4.1 Conclusions

Although Alternatives C through F would reduce the number of WTGs and their associated IACs, which would have an associated reduction in potential collision risk, BOEM expects that the impacts to birds resulting from the alternative alone would be similar to the Proposed Action and range from **negligible** to **minor** adverse. Therefore, BOEM expects the overall impact on birds from the Proposed Action alone to be long term **minor** adverse; however, the resource would recover completely after decommissioning without remedial or mitigating action.

In the context of other reasonably foreseeable environmental trends and planned actions, BOEM also expects that Alternatives C through F's impacts would be similar to the Proposed Action (with individual IPFs leading to impacts ranging from **negligible** to **minor** adverse and **minor** beneficial). The overall impacts of Alternatives C through F when combined with past, present, and reasonably foreseeable activities would therefore be the same level as under the Proposed Action: **minor** adverse.

3.7.2.5 Alternative G: Impacts of the Preferred Alternative on Birds

Table 3.7-1 provides a summary of IPF findings for this alternative.

3.7.2.5.1 Conclusions

Although Alternative G would reduce the number of WTGs and their associated IACs, which would have an associated reduction in potential collision risk, BOEM expects that the impacts to birds resulting from the alternative alone would be similar to the Proposed Action and range from **negligible** to **minor** adverse. Therefore, BOEM expects the overall impact on birds from the Proposed Action alone to be long term **minor** adverse; however, the resource would recover completely after decommissioning without remedial or mitigating action.

In the context of other reasonably foreseeable environmental trends and planned actions, BOEM also expects that Alternative G's impacts would be similar to the Proposed Action (with individual IPFs leading to impacts ranging from **negligible** to **minor** adverse and **minor** beneficial). The overall impacts of Alternative G when combined with past, present, and reasonably foreseeable activities would therefore be the same level as under the Proposed Action: **minor** adverse.

3.7.2.6 Mitigation

Mitigation measures resulting from agency consultations for birds are identified in Appendix F, Table F-2, and addressed in Table 3.7-3. Conservation recommendations proposed to BOEM by the USFWS on May 30, 2023, are identified in Appendix F, Table F-3, and addressed in Table 3.7-4.

Table 3.7-3. Mitigation and Monitoring Measures Resulting from Consultations for Birds (Appendix F, Table F-2)

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
Bird-perching deterrent devices	To minimize attracting birds to operating turbines, the Lessee must install anti-perching devices on WTGs and the OSS. The location of anti-perching devices must be proposed by the Lessee based on BMPs applicable to the appropriate operation and safe installation of the devices. The Lessee must confirm the locations of anti-perching devices with a monitoring plan to track the efficacy of the anti-perching devices as part of the as-built documentation it must submit with the facility design report.	Anti-perching devices would discourage birds from perching on WTGs and the OSS, which would reduce the risk of collision with WTGs as well as minimize the perching of avian predators.
Annual bird and bat mortality reporting	The Lessee must submit an annual report covering each calendar year, due by January 31 of the following year, documenting any dead (or injured) birds or bats found on vessels and structures during construction, operations, and decommissioning. The report must be submitted to BOEM (at renewable_reporting@boem.gov) and BSEE (at OSWSubmittals@bsee.gov) and the USFWS. The report must contain the following information: species name, 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 USGS Bird Band Laboratory (https://www.usgs.gov/labs/bird-banding-laboratory). Any occurrence of dead ESA-listed birds or bats must be reported to BOEM, BSEE, and the USFWS as soon as practicable (taking into account crew and vessel safety), but no later than 24 hours after the sighting, and if practicable, the dead specimen must be carefully collected to preserve the material in the best possible state.	This measure would not reduce impacts; however, the data gathered from the mortality reporting would be used to evaluate impacts and potentially lead to additional mitigation measures, if required (30 CFR 585.633(b)).
Annual bird and bat mortality reporting	Any occurrence of dead ESA birds or bats must be reported to BOEM, BSEE, and USFWS as soon as practicable (taking into account crew and vessel safety), but no later than 24 hours after the sighting, and if practicable, carefully collect the dead specimen and preserve the material in the best possible state.	This measure would not reduce impacts; however, the data gathered from the mortality reporting would be used to evaluate impacts and potentially lead to additional mitigation measures, if required (30 CFR 585.633(b)).

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
Avian and bat monitoring program	At least 45 calendar days before beginning surveys, the Lessee must complete, obtain concurrence from the DOI, and adopt an avian and bat monitoring plan (ABMP), as described in Revolution Wind's *Avian and Bat Post-Construction Monitoring Framework* (see Appendix G and COP Appendix AA), including coordination with interested stakeholders. The DOI will review the ABMP and provide any comments on the plan within 30 calendar days of its submittal. The Lessee must resolve all comments on the ABMP to the DOI's satisfaction before implementing the plan. The Lessee may conclude that the DOI has concurred in the ABMP if the DOI provides no comments on the plan within 30 calendar days of its submittal date. a. Monitoring. The Lessee must 1) install acoustic monitoring devices for bats for 2 years, 2) install Motus receivers within the wind farm, 3) refurbish up to two onshore Motus receiver stations, 4) provide funding for up to 150 Motus tags per year for up to 3 consecutive years, and 5) conduct a 1- to 2-year cross-Project radar study to measure migrant flux rates and flight heights and marine bird avoidance. b. Annual monitoring reports. The Lessee must submit to BOEM (at renewable_reporting@boem.gov), the USFWS, and BSEE (at OSWSubmittals@bsee.gov) a comprehensive report after each full year of monitoring (preconstruction and postconstruction) within 6 months of completion of the last avian survey. The report must include all data, analyses, and summaries regarding ESA-listed and non-ESA-listed birds and bats. The DOI will use the annual monitoring reports to assess the need for reasonable revisions (based on SME analysis) to the ABMP. The DOI reserves the right to require reasonable revisions to the ABMP and may require new technologies as they become available for use in offshore environments. c. Postconstruction quarterly progress reports. The Lessee must submit quarterly progress reports during the implementation of the ABMP to BOEM (at	This measure would not reduce impacts; however, the data gathered from the monitoring would be used to evaluate impacts and potentially lead to additional mitigation measures, if required (30 CFR 585.633(b)).

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	renewable_reporting@boem.gov) and the USFWS by the fifteenth 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. d. Monitoring plan revisions. Within 15 calendar days of submitting the annual monitoring report, the Lessee must meet with BOEM and the USFWS to discuss the following: the monitoring results; the potential need for revisions to the ABMP, including technical refinements or additional monitoring; and the potential need for any additional efforts to reduce impacts. If the DOI determines after this discussion that revisions to the ABMP are necessary, the DOI may require the Lessee to modify the ABMP. If the reported monitoring results deviate substantially from the impact analysis included in the Final EIS, the Lessee must transmit to DOI recommendations for new mitigation measures and/or monitoring methods. e. Operational reporting (operations). The Lessee must submit to BOEM (at renewable_reporting@boem.gov) and BSEE (at OSWSubmittals@bsee.gov) an annual report summarizing the following monthly operational data calculated from 10-minute SCADA for all turbines together in tabular format: the proportion of time the turbines were operational (spinning at > x rpm) each month, the average rotor speed (monthly rpms) of spinning turbines plus 1 standard deviation, and the average pitch angle of blades (degrees relative to rotor plane) plus 1 standard deviation. The DOI will use this information as inputs for avian collision risk models to assess whether the results deviate substantially from the impact analysis included in the Final EIS. f. Raw data. The Lessee must store the raw data from all avian and bat surveys and monitoring activities according to	

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	accepted archiving practices. Such data must remain accessible to the DOI and USFWS, upon request for the duration of the lease. The Lessee must work with BOEM to ensure the data are publicly available. The USFWS may specify third-party data repositories that must be used, such as the Motus Wildlife Tracking System or MoveBank, and such parties and associated data standards may change over the duration of the monitoring plan.	
Adaptive mitigation for birds and bats	If the reported postconstruction bird and bat monitoring results (generated as part of Revolution Wind's *Avian and Bat Post-Construction Monitoring Framework* [BRI 2023]) indicate bird and bat impacts deviate substantially from the impact analysis included in this EIS, then Revolution Wind must make recommendations for new mitigation measures or monitoring methods.	This mitigation measure, if adopted, ensures that Project activities would not impact birds beyond the negligible to minor range of impacts discussed in this EIS.
Marine debris elimination	Materials, equipment, tools, containers, and other items used in Atlantic OCS activities that could be lost or discarded overboard must be marked to clearly identify the owner and must be durable enough to resist the effects of the environmental conditions to which they may be exposed.	This mitigation measure, if adopted, ensures that Project activities would not impact birds beyond the negligible to minor range of impacts discussed in this EIS.
USFWS Biological Opinion RPM 1 to minimize take of piping plovers and rufa red knots*	Periodically review current technologies and methods for minimizing collision risk of migratory birds with WTGs, including but not limited to: WTG coloration/marking, lighting, avian deterrents, remote sensing such as radar and thermal cameras, and limited WTG operational changes.*†	This measure would provide incremental reductions in impacts for two listed birds species, would improve accountability, and reduce uncertainty associated with estimated rates of collision mortality, but would not alter the overall impact determination of the Proposed Action.
USFWS Biological Opinion RPM 2 to minimize take of piping plovers and rufa red knots*	Implement those technologies and methods deemed reasonable and prudent to minimize collision risk.*‡	This measure would provide incremental reductions in impacts for two listed birds species, would improve accountability, and reduce uncertainty associated with estimated rates of collision mortality, but would not alter the overall impact determination of the Proposed Action.
USFWS Biological Opinion Terms and Conditions 1: Collision	Periodically review current technologies and methods for minimizing collision risk of listed birds.	This measure would provide incremental reductions in impacts for two listed birds species, would improve accountability, and reduce uncertainty associated with estimated rates of collision

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
risk minimization and monitoring*	• Prior to the start of WTG operations at Revolution Wind, BOEM must compile, from existing project documentation (e.g., the BA, other consultation documents, the final EIS, the COP), a stand-alone summary of technologies and methods that BOEM evaluated to reduce or minimize bird collisions at the Revolution Wind WTGs. • Within 5 years of the start of WTG operation, and then every 5 years for the life of the project, BOEM must prepare a Collision Minimization Report (CMR), reviewing best available scientific and commercial data on technologies and methods that have been implemented, or are being studied, to reduce or minimize bird collisions at offshore and onshore WTGs. The review must be global in scope. • BOEM must distribute a draft CMR to the USFWS, Revolution Wind, and appropriate state agencies for a 60-day review period. BOEM must address all comments received during the review period and issue the final report within 60 days of the close of the review period. • Within 60 days of issuing the final CMR, BOEM must convene a meeting with the USFWS, Revolution Wind, and appropriate state agencies to discuss the report and seek consensus on whether implementation of any technologies/methods are reasonable and prudent. If consensus cannot be reached, the USFWS will consider input from the meeting participants and make the final determination of whether any measures are reasonable and prudent and should be implemented under RPM 2.*	mortality, but would not alter the overall impact determination of the Proposed Action.
USFWS Biological Opinion Terms and	Implement those technologies and methods deemed reasonable and prudent.	This measure would provide incremental reductions in impacts for two listed birds species, would improve accountability, and

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
Conditions 2: Implementation of measures to minimize take of piping plovers and rufa red knots*	• BOEM will require Revolution Wind to adopt and deploy reasonable and prudent technologies and methods to avoid or minimize take of the piping plover and rufa red knot. BOEM will specify the USFWS-approved timeframe in which any required minimization measure(s) must be implemented, as well as any requirements to monitor, maintain, or adapt the measure(s) over time. • BOEM will require Revolution Wind to provide periodic reporting on the implementation of any minimization measure(s) according to a schedule developed by BOEM and approved by the USFWS.*	reduce uncertainty associated with estimated rates of collision mortality, but would not alter the overall impact determination of the Proposed Action.

* Information in these rows was taken directly from the final biological opinion (USFWS 2023) has not been edited.

† Operational changes may include, but are not limited to, feathering, which involves adjusting the angle of the blades to slow or stop them from turning under certain conditions.

‡ Reasonable and prudent minimization measures will include only actions that occur within the action area, involve only minor changes to the project, and reduce the projected level of take. Measures are reasonable and prudent when they (and their implementing terms and conditions) are consistent with the project's basic design, location, scope, duration, and timing (50 CFR 402.14(i)(i)(2)). The reasonableness determination will consider both technical and economic factors; the test for reasonableness is whether the proposed measure would cause more than a minor change to the project. The prudency determination will consider the likelihood, based on best available information, of successfully and appreciably reducing bird collisions relative to the cost and technical difficulty of the measure. The BOEM and the Service will ensure that any reasonable and prudent measures and terms and conditions are within the legal authority and jurisdiction of the BOEM and Revolution Wind to carry out.

Table 3.7-4. Additional Mitigation and Monitoring Measures under Consideration for Birds (Appendix F, Table F-3)

Mitigation Measure*	Description*	Expected Effect on Impacts from Action Alternatives
USFWS Biological Opinion Conservation Recommendation 1: Adopt compensatory mitigation ratios greater than 1:1	Estimated levels of collision mortality are associated with high uncertainty. Future advancements in SCRAM are expected to substantially reduce, but not eliminate, uncertainty. In addition, compensatory mitigation actions will likely be associated with their own levels of uncertainty (e.g., probability of success, actual number of bird mortalities offset), and may occur later in time that the project-induced mortality. Thus, the USFWS recommends a compensatory	Pursuant to 50 CFR 402.14(j), conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information

Mitigation Measure*	Description*	Expected Effect on Impacts from Action Alternatives
	mitigation ratio greater than 1:1, particularly given the extent of full buildout of WTGs anticipated on the OCS.	
USFWS Biological Opinion Conservation Recommendation 2: Establish an Offshore Wind Adaptive Monitoring and Impact Minimization Framework to guide and coordinate monitoring, research and avian impacts assessment coastwide.	To address Service concerns related to potential effects of WTG operation on listed and other species of concern, at both the project and coastwide scales, the USFWS recommends that the BOEM develop and adopt an Offshore Wind Adaptive Monitoring and Impact Minimization Framework (Framework) for flying wildlife. Many details will need to be worked out, but here the USFWS provides some basic principles for establishment, adoption, and operation of the Framework. • Establish a Framework Principals Group to consist of representatives from the BOEM, the BSEE, the USFWS, State natural resource agencies responsible for management of birds, bats, and insect, and offshore wind energy developers/operators. • Develop and adopt a written Framework foundational document specifying: ○ the governance structure of the Principals Group; ○ the geographic coverage of the Framework; ○ the species covered by the Framework; and ○ the duration of the Framework. • Establish an annual operating budget for the Framework to be funded by offshore wind energy developers/operators. • Arrange for the Principals Group to meet at least annually, and for the Framework foundational document to be updated at least every 5 years. • Provide for experts (both internal and external to the Principals Group) to regularly assess new and improved technologies and methods for estimating collision risk of covered species and measuring or	Pursuant to 50 CFR 402.14(j), conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information

Mitigation Measure*	Description*	Expected Effect on Impacts from Action Alternatives
	detecting collisions. Adopt and deploy such methods deemed most promising by the Principals Group. • Coordinate monitoring and research across wind energy projects. Share and pool data and research results coastwide. • Provide for experts (both internal and external to the Principals Group) to regularly assess new and improved technologies and methods for minimizing collision risk of covered species. Adopt and deploy such technologies/methods deemed most promising by the Principals Group. • Provide for experts (both internal and external to the Principals Group) to periodically assess new and improved technologies and methods for evaluating indirect effects to covered species from WTG avoidance behaviors (e.g., impacts to time and energy budgets). • Periodically assess the level and type of compensatory mitigation necessary to offset any unavoidable direct and indirect effects of WTG operation on covered species. Adopt and require the levels and types of mitigation deemed appropriate by the Principals Group. • Consider partnering with other stakeholders or cross-sector organizations to provide administrative, institutional, and technical support to the Principals Group.	
USFWS Biological Opinion Conservation Recommendation 3: Conduct a coastwide buildout analysis that considers all existing, proposed, and future	The definition of "cumulative effects" at 50 CFR 402.02 excludes future Federal actions because such actions will be subject to their own consultations under section 7 of the ESA. Further, the analysis of environmental baseline conditions for each subsequent consultation would be limited to the action area of that particular project. While we can use the Status of the Species section of a biological opinion to capture the	Pursuant to 50 CFR 402.14(j), conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information

Mitigation Measure*	Description*	Expected Effect on Impacts from Action Alternatives
offshore wind energy development on the Atlantic OCS	anticipated effects of completed consultations, we cannot consider additive effects of concurrent, ongoing consultations. Even this creates a situation where the effects analysis for each individual offshore wind energy project cannot fully account for synergistic effects that may occur with nearby projects and especially not full build-out of offshore wind infrastructure along the coast. Besides the two existing offshore wind energy facilities (Block Island Wind offshore Rhode Island and Coastal Virginia Offshore Wind), we understand there are 26 additional projects in various stages of development offshore the U.S. coast from Maine to Virginia. As the Department of the Interior continues moving toward the national goal of deploying 30 gigawatts of offshore wind by 2030, we anticipate still more projects beyond those 26 (e.g., within the New York Bight, Central Atlantic, and Gulf of Maine). While the Service will complete a thorough assessment of potential direct and indirect effects for each individual offshore wind project, a coastwide analysis may indicate or suggest additive and/or synergistic effects among projects. Therefore, the Service recommends that BOEM analyze potential aggregate effects from WTG operation at a coastwide scale. A coastwide analysis will work in concert with the Offshore Wind Adaptive Monitoring and Impact Minimization Framework to comprehensively assess, monitor, and manage avian impacts from wind energy development along the U.S. Atlantic coast. A Programmatic consultation for wind energy development in the New York Bight is already underway and could set the stage for a full coastwide analysis. Ultimately, a coastwide programmatic Opinion may emerge as the most effective and efficient mechanism for assessing, monitoring, minimizing, and offsetting effects to listed birds from WTG operation on the OCS.	

Note: The USFWS acknowledges that the manner and extent to which these recommendations are implemented are at the discretion of BOEM/BSEE.

* Information in these rows was taken directly from the final biological opinion (USFWS 2023) and has not been edited.

3.7.2.6.1 Measures Incorporated into the Preferred Alternative

Mitigation measures resulting from consultations, authorizations, and permits listed in Table 3.7-3 and in Appendix F, Table F-2 are incorporated into Alternative G (Preferred Alternative). The anti-perching devices would reduce the risk of collision with WTGs as well as minimize the perching of avian predators. The additional measures would further define how the effectiveness and enforcement of EPMs would be ensured and improve accountability for compliance with EPMs by implementing an avian and bat monitoring program. Because these measures ensure the effectiveness of and compliance with EPMs that are already analyzed as part of the Proposed Action, implementation of these measures would not further reduce the impact level of the Proposed Action but would ensure that Project activities would not impact birds beyond the negligible to minor range of impacts discussed in this EIS, and the data gathered from avian mortality reporting would be used to evaluate impacts and potentially lead to additional mitigation measures, if required (30 CFR 585.633(b)).

3.8 Coastal Habitats and Fauna

3.8.1 Description of the Affected Environment and Environmental Consequences of the No Action Alternative for Coastal Habitats and Fauna

Geographic analysis area: The GAA for coastal habitats and fauna (Figure 3.8-1) comprises the construction footprints for the following onshore Project components: the onshore transmission cable, landfall work area, OnSS, and ICF. The coastal habitats within the GAA include the area from state waters inland to the mainland, including the foreshore, backshore, dunes, and interdunal areas. Aquatic habitats are discussed in Section 3.21 and Section 3.6. Offshore components of the Project would not impact coastal habitat and fauna other than certain avian and bat species, which are discussed in Section 3.7 and Section 3.5, respectively.

Affected environment: Appendix K of the COP includes the results of field investigations conducted for the Project's onshore facilities as well as descriptions of habitats, delineations of freshwater and coastal wetlands, identification of plant and wildlife species, records of rare species observations, and observations of invasive species (VHB 2023). Plant communities were documented by VHB and compared to the key habitat profiles provided in the RIWAP (Rhode Island DEM et al. 2015) to assign the appropriate plant communities within the GAA. These plant communities are provided in Table 3.8-1 and described below. "Native coastal fauna" is defined herein as terrestrial mammals, reptiles, amphibians, and terrestrial and intertidal invertebrates. Most of the GAA for coastal habitats and fauna is disturbed from previous anthropogenic uses. Therefore, habitat quality and the potential suitability for use by fauna have been degraded. However, several key habitats, as identified in the RIWAP (Rhode Island DEM et al. 2015), suitable to a range of wildlife and plant species are present in the GAA. Invasive plant species are prevalent throughout the GAA because of prior anthropogenic disturbance (VHB 2023). VHB identified habitat for a variety of terrestrial mammals, reptiles, and amphibians during habitat assessment surveys conducted on July 30, August 14, September 3, and December 10, 2019, and March 27 and July 13, 2020.

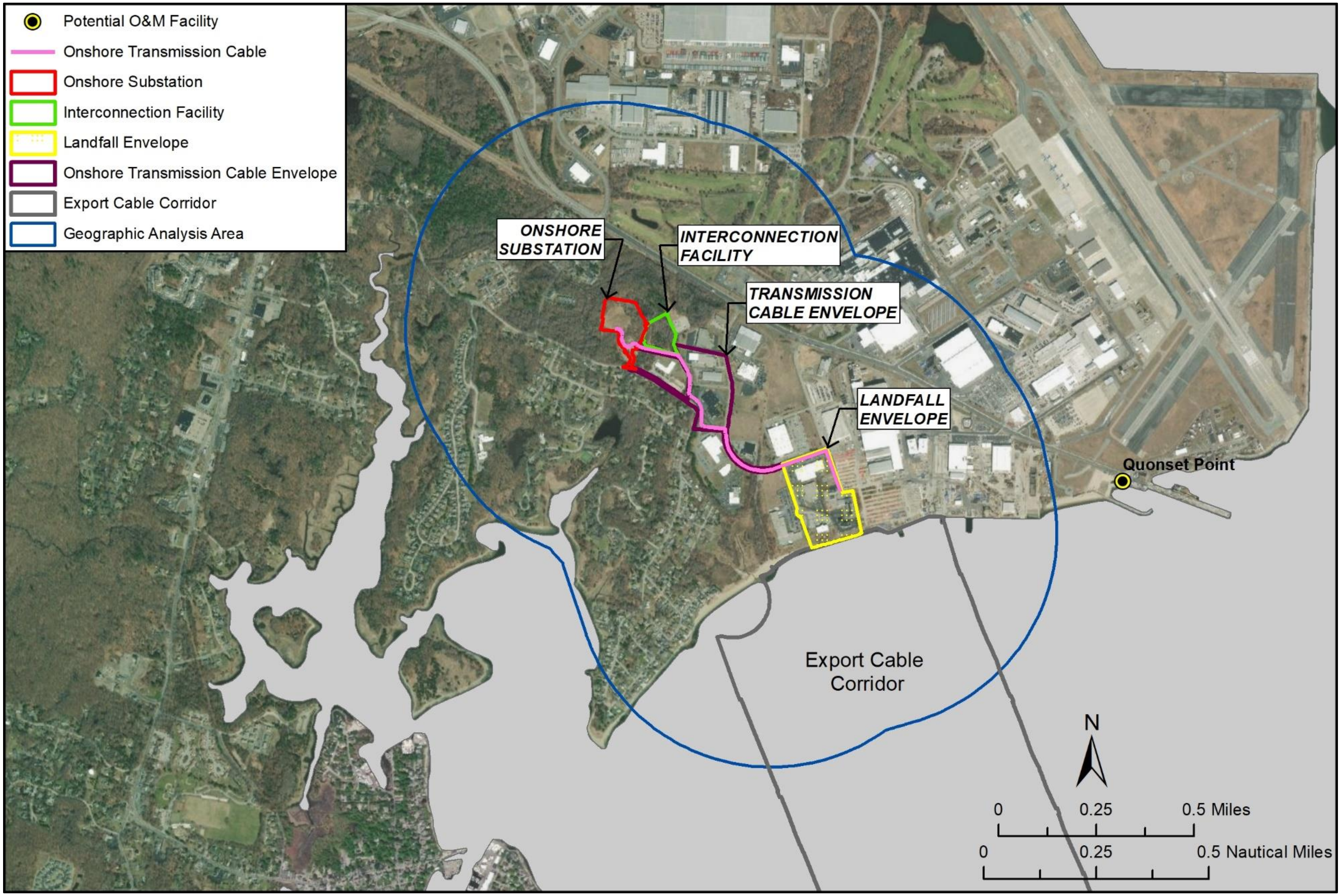

Figure 3.8-1. Geographic analysis area for coastal habitats and fauna.

Table 3.8-1. Plant Communities in the Geographic Analysis Area for Coastal Habitats and Fauna

Plant Community	Area in the Geographic Analysis Area (acres)
Landfall Work Area	
Modified coastal beach	0.330
Ruderal grassland/shrubland	1.300
OnSS	
Mixed oak/white pine forest	3.800
Capped landfill	2.600
Pitch pine barren	0.600
Ruderal shrub marsh	0.001
ICF	
Mixed oak/white pine forest	3.500
Ruderal forested swamp	0.100
Ruderal grassland/shrubland	0.050
Ruderal shrub marsh	0.010
Transmission Cable Envelope	
Mixed oak/white pine forest	0.560
Softwood forest	0.320
Mowed lawn	0.020
Ruderal grassland/shrubland	0.020
Oak forest	0.008
Pitch pine barren	0.006

Source: VHB (2023); Rhode Island DEM et al. (2015).

Landfall Work Area

The modified coastal beach plant community comprises areas within the landfall work area that have been altered by placement of seawalls and riprap revetments, which expose the sandy beach during low tides. Vegetation at the base of the seawall and along the top of the seawall includes spotted knapweed (*Centaurea maculosa*), an invasive species; common milkweed (*Asclepias syriaca*); prickly lettuce (*Lactuca serriola*); and American pokeweed (*Phytolacca americana*). Adjacent to areas of modified coastal beach, the landfall work area contains ruderal grassland/shrubland. Ruderal grasslands/shrublands constitute early successional habitats defined by Anderson et al. (1976) as uplands where the potential natural vegetation is predominantly grasses, grass-like plants, forbs, or shrubs. Such habitats are typically anthropogenically created or maintained due to management strategies. The vegetation within ruderal grassland/shrubland areas is similar to the species composition along the seawall described above and also includes northern bayberry (*Myrica pensylvanica*) and eastern red cedar (*Juniperus virginiana*) (VHB 2023).

Transmission Cable Envelope

The transmission cable envelope is comprised primarily of industrial and residential land uses and consists of lots with managed lawns. Although managed lawn is not considered a key habitat by the RIWAP, it provides limited utility to some species of wildlife (e.g., passerines and rodents) in an otherwise heavily developed industrial and commercial area. It should be noted that some of these lots containing only managed lawn may be designated for future development (VHB 2023). The preferred transmission cable route is an approximate 1 mile (1.6 km) route that would predominantly follow along paved roads or previously disturbed areas such as parking lots.

Some of the alternative routes under consideration within the transmission cable envelope contain segments that would pass through undeveloped, vegetated areas and would be approximately the same length. Alternative transmission cable routes would pass a vacant lot that supports a dry ruderal grassland/shrubland field that gently slopes downward toward an access path. This plant community supports a mix of shrubs and herbaceous forbs and grasses, including eastern red cedar, pitch pine (*Pinus rigida*), *Yucca* sp., Virginia creeper (*Parthenocissus quinquefolia*), and common milkweed. The ruderal grassland/shrubland supports some invasive species, including autumn olive (*Elaeagnus umbellate*), Morrow's honeysuckle (*Lonicera morrowii*), Asiatic bittersweet (*Celastrus orbiculatus*), and mugwort (*Artemisia* sp.). Alternative onshore cable transmission routes would also pass through upland forest and shrubland. Vegetation within this area shows signs of anthropogenic disturbance and is composed of a ruderal mixed oak/white pine forest with a shrubby understory. Dominant vegetation within the canopy layer includes eastern white pine (*Pinus strobus*), red oak (*Quercus rubra*), white oak (*Quercus alba*), and eastern red cedar. Dominant species within the shrub and herb stratum include autumn olive, Morrow's honeysuckle, Asiatic bittersweet, multiflora rose (Rosa multiflora), green briar (*Smilax rotundifolia*), garlic mustard (*Alliaria petiolata*), and poison ivy (*Toxicodendron radicans*) (VHB 2023).

Onshore Substation and Interconnection Facility

The primary plant community within the footprint of both the OnSS and the ICF is mixed oak/white pine forest. Dominant species within the canopy include red oak, black oak (*Quercus velutina*), scarlet oak (*Quercus coccinea*), and eastern white pine, and other canopy species include red maple, black cherry *(Prunus serotina*), and black birch (*Betula lenta*). Understory vegetation includes Morrow's honeysuckle, green briar, Virginia creeper, and spotted wintergreen (*Chimaphila maculata*). As with the adjoining ruderal forested swamp that occurs within the OnSS footprint (described below), the oak and white pine forest shows signs of human disturbance from its previous use as a landfill.

Ruderal forested swamp is also present within the OnSS footprint. The dominant canopy species within the forested swamp is red maple (*Acer rubrum*) with scattered patches of black gum (*Nyssa sylvatica*), swamp white oak (*Quercus bicolor*), red oak, and eastern white pine. The understory contains scattered sapling recruitment from the canopy layer and shrub thickets of sweet pepperbush (*Clethra alnifolia*), highbush blueberry (*Vaccinium corymbosum*), winterberry (*Ilex verticillata*), and alder (*Alnus* sp.). Poison ivy, green briar, sensitive fern (*Onoclea sensibilis*), and skunk cabbage (*Symplocarpus foetidus*) are common in the herbaceous stratum. A ruderal shrub marsh is present in the northern part of the OnSS footprint. The southern boundary of the marsh is highly altered, with demolition debris stacked along slopes above the marsh. The northern limit of the marsh extends beyond the OnSS footprint based on available topographic mapping and aerial photographs. The ruderal shrub marsh has a forested perimeter, and open water seasonally inundates the shrubland cover type (VHB 2023).

A large area (2.6 acres) within the OnSS footprint is considered capped landfill because of the alterations associated with the former Camp Avenue Dump, which is listed on the Superfund Enterprise Management System database as a State Hazardous Waste Site. From approximately 1949 to 1953, and as late as 1970, the Camp Avenue Dump was used as a general landfill by the U.S. Navy before the Quonset Point Naval Air Station was deactivated in 1974. Previous studies conducted at the dump, as well as field observations during Project surveys, reported wastes such as construction debris, roofing tar, ship parts, and unspecified industrial waste (VHB 2020). Evidence of the site's past use as a landfill is present throughout with fill artifacts, disturbed topography that indicates previous cutting and filling, and pervasive invasive vegetation that includes glossy buckthorn (*Frangula alnus*), Asiatic bittersweet, Morrow's honeysuckle, black locust (*Robinia pseudoacacia*), multiflora rose, privet (*Ligustrum* sp.), tree of heaven (*Ailanthus altissima*), black swallow-wort (*Cynanchum louiseae*), mugwort, and garlic mustard (VHB 2023).

General wildlife records for the GAA are based on observations made during VHB's field investigations in July, August, September, and December 2019 and March and July 2020; the review of the RIWAP for species tied to specific key habitats within the GAA; and other pertinent literature, including *New England Wildlife: Habitat, Natural History, and Distribution* (DeGraaf and Yamasaki 2001). Appendix C in COP Appendix K (VHB 2023) provides a list of wildlife species observed during field investigations and species with the potential to occur within the GAA based on habitat preferences and habitat availability.

VHB evaluated information from the USFWS IPaC tool and the Rhode Island DEM ERM to assess if any federal or state-listed species; rare, threatened, or endangered species; or species of greatest conservation need were present within the analysis area. During field investigations for the onshore transmission cable, butterfly milkweed (*Asclepias tuberosa*), a Rhode Island state species of concern was recorded. Butterfly milkweed has showy orange flowers in umbels and occurs within disturbed habitats, grassland, meadows, and fields. As with other milkweed species, this plant provides important food sources for the larval form of butterfly species. This includes the monarch butterfly (*Danaus plexippus*), which is a candidate species under the federal ESA (Monarch Joint Venture 2019; USFWS 2019). In accordance with Rhode Island Natural Heritage Program (RINHP) policy, the occurrence of butterfly milkweed within these habitats will be reported to the RINHP during the state permitting process. No other federal or state-listed species; rare, threatened, or endangered species; species of greatest conservation need; or associated critical habitats, other than those discussed in Sections 3.5 and 3.7, were identified as having the potential to occur within the GAA for coastal habitats and fauna (BOEM 2022, 2023; VHB 2023).

3.8.2 Environmental Consequences

3.8.2.1 Relevant Design Parameters, Impact-Producing Factors, and Potential Variances in Impacts

This assessment analyzes the maximum-case scenario; however, there is the potential for variances in the Project build-out, as defined in the PDE (see Appendix D). The Project design parameters that would influence the magnitude of the impacts on coastal habitats and fauna include the location of the OnSS and ICF, the location of construction within the landfall work area and within the transmission cable envelope, and the time of year during which construction occurs. For example, the summer and fall months (May through October) constitute the most active season for coastal fauna in this area, especially reptiles and amphibians. Therefore, construction during months in which coastal fauna are not present, not breeding, or less active would have fewer impacts than construction during more active times.

The following EPMs would be implemented to minimize potential impacts to coastal habitats and fauna:

- Onshore facilities would be sited within previously disturbed and developed areas to the extent practicable, as follows:
    - Revolution Wind evaluated siting alternatives for the OnSS using the criteria that included avoidance or minimization of disturbance to ecologically sensitive areas.
    - The OnSS and ICF would be located on parcels that are already highly altered and include buried demolition waste.
    - The transmission cable would be located primarily in unvegetated and previously disturbed or developed ROWs.
- Accidental spills or releases of oils or other hazardous materials offshore would be managed through the OSRP.
- At the landfall location, drilling fluids would be managed within a contained system to be collected for reuse, as necessary. An HDD contingency plan would be prepared and implemented to minimize the potential risks associated with release of drilling fluids.
- Revolution Wind would comply with the RIPDES General Permit for Stormwater Discharges associated with construction activity, which requires the implementation of a soil erosion and sedimentation control (SESC) plan and spill prevention and control measures.
- An SESC plan, including erosion and sedimentation control measures, would be implemented to minimize potential water quality impacts during construction and operation of the onshore facilities. Revolution Wind would implement the site-specific SESC plan and maintain it during the entire construction process until the entire worksite is permanently stabilized by vegetation or other means. The measures employed in the SESC plan use BMPs to minimize the opportunity for turbid discharges leaving a construction work area.
- The spill prevention and control measures mandate that the operator identifies all areas where spills can occur and their accompanying drainage points. The operator must also establish spill prevention and control measures to reduce the chance of spills, stop the source of spills, contain and clean up spills, and dispose of materials contaminated by spills. Spill prevention and control training would be provided for relevant personnel.
- The perimeter surrounding onshore facilities would be managed to encourage the growth of native grasses, ferns, and low-growing shrubs. This management strategy would include the removal of invasive plants in compliance with state and federal regulations (e.g., herbicide use would not be permitted within regulated wetlands).
- In accordance with Section 2.9(B)(1)(d) of the Freshwater Wetland Rules, the onshore facilities would be designed to avoid and minimize impacts to freshwater wetlands to the maximum extent practicable. Any wetlands that would be impacted as a result of the Project would be mitigated via

the federal and state permitting process in accordance with Section 404 of the CWA and the Freshwater Wetland Rules.

- The documented sickle-leaved golden aster (*Pityopsis falcata*) population on the OnSS parcel would be protected during construction.

These EPMs would be implemented across all alternatives; therefore, BOEM would not expect measurable potential variances in impacts across the alternatives.

See Appendix E1 for a summary of IPFs analyzed for coastal habitats and fauna across all action alternatives. IPFs that are either not applicable to the resource or determined by BOEM to have a negligible adverse effect are excluded from Chapter 3 and provided in Table E2-1 in Appendix E1. Offshore and onshore IPFs are addressed separately in the analysis if appropriate for the resource; not all IPFs have both an offshore and onshore component. Where feasible, calculations for specific alternative impacts are provided in Appendix E4, to facilitate reader comparison across alternatives.

Table 3.8-2 provides a summary of IPF findings carried forward for analysis in this section. Each alternative analysis discussion consists of the construction and installation phase, the O&M phase, the decommissioning phase, and the cumulative analysis. If these analyses are not substantially different, then they are presented as one discussion.

A detailed analysis of the Proposed Action is provided following the table. Detailed analysis of other considered action alternatives is also provided below the table if analysis indicates that the alternative(s) would result in substantially different impacts than the Proposed Action.

The Conclusion section within each alternative analysis discussion includes rationale for the overall effect call determination for that alternative. The overall impact of any alternative would be **minor** adverse because the effects on coastal habitats and fauna would be small, and the resource would be expected to recover completely, with no mitigation required.

Table 3.8-2. Alternative Comparison Summary for Coastal Habitats and Fauna

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTGs	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
Climate change	**Onshore**: Impacts of climate change could contribute to impacts on coastal habitats and fauna primarily according to existing global and regional climate trends. Although the impacts resulting from climate change on coastal habitats and fauna are uncertain, BOEM anticipates that future offshore wind activities, without the Proposed Action, could have **negligible** adverse impacts on onshore coastal habitats and fauna.	**Onshore**: Climate change would contribute to impacts on coastal habitats and fauna primarily according to existing global and regional climate trends. The Proposed Action could contribute to a long-term net decrease in GHG emissions. This difference may not be measurable but would help reduce climate change impacts. Although the impacts resulting from climate change on coastal habitats and fauna are uncertain, BOEM anticipates that the Proposed Action would have no measurable influence on climate change and therefore the resulting impacts to coastal habitats and fauna would be **negligible** adverse. No additional impacts from climate change beyond those discussed under the impacts analysis for construction and installation are expected during O&M and Project decommissioning. The types of cumulative impacts from global climate change to coastal habitats and fauna described under the No Action Alternative would occur under the Proposed Action. However, the Project could also contribute to a long-term net decrease in GHG emissions. This difference may not be measurable but would help reduce climate change impacts (although effects would still be **negligible** to **minor** adverse).	**Onshore**: Alternatives C through F would not alter impacts to onshore activities. Therefore, construction, O&M and Project decommissioning impacts would be the same as the Proposed Action: **negligible** adverse. Cumulative impacts would also be the same as the Proposed Action: **negligible** to **minor** adverse.				**Onshore**: Alternative G would not alter impacts to onshore activities. Therefore, construction, O&M, and Project decommissioning impacts would be the same as the Proposed Action: **negligible** adverse. Cumulative impacts would also be the same as the Proposed Action: **negligible** to **minor** adverse.
Presence of structures	**Onshore**: In addition to electrical infrastructure, some habitat conversion may result from port expansion activities required to meet the demands for fabrication, construction, transportation, and installation of wind energy structures as well as onshore substations and associated facilities. Land disturbance for construction of	**Onshore**: The operational footprints of the OnSS and ICF would create habitat loss when forested upland is cleared and replaced with hard structures and crushed gravel yards that are not capable of supporting plants or wildlife. The ICF would result in a loss of approximately 1.6 acres of mixed oak/white pine forest, which is reflective of the operational footprint of the ICF. The OnSS would result in a loss of 3.8 acres of mixed oak/white pine forest. Together, these losses represent a relatively small fraction of the 52 acres of contiguous habitat identified in the RIWAP (Rhode Island DEM et al. 2015) and represent a **negligible** to **minor** adverse impact to coastal habitats. Overall, the habitat loss that would result from the construction of the OnSS and ICF would be considered negligible because	**Onshore**: Alternatives C through F would not alter impacts to onshore activities. Therefore, construction, O&M and Project decommissioning impacts would be the same as the Proposed Action: **negligible** to **minor** adverse. Cumulative impacts would also be the same as the Proposed Action: **negligible** to **minor** adverse.				**Onshore**: Alternative G would not alter impacts to onshore activities. Therefore, construction, O&M, and Project decommissioning impacts would be the same as the Proposed Action: **negligible** to **minor** adverse. Cumulative impacts would also be the same as the Proposed Action: **negligible** to **minor** adverse.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTGs	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
	onshore substations, associated facilities, and port expansion activities in the GAA is expected to result in **negligible** to **minor** adverse impacts to coastal habitat and fauna.	this loss would be small relative to the unimpacted similar habitat in the general region. At the OnSS and ICF, land disturbance in the form of vegetation management would occur on a periodic basis to maintain vegetation at shrub height. Presence of structures as it relates to vegetation clearing may result in the direct injury or mortality of wildlife as well as habitat alteration or removal. Impacts from vegetation management may include reduction in habitat quality via the spread of invasive species and temporary displacement of individuals. However, the spread of invasive species would be controlled with periodic vegetation management, and wildlife displacement could occur only during vegetation removal activities. The impact of habitat degradation and wildlife displacement resulting from vegetation management of the OnSS and ICF is expected to be short term **negligible** adverse. The impact of habitat degradation and/or loss, wildlife displacement, and wildlife injury and/or mortality resulting from land disturbance during decommissioning of the OnSS and ICF would be short term **negligible** adverse. Because of the small amount of affected onshore habitat, land disturbance from the Proposed Action when added to other past, present, and reasonably foreseeable projects would result in **negligible** to **minor** adverse cumulative impacts to coastal habitats and fauna.					

Note: Each cell includes analysis for the construction and installation phase, the O&M phase, the decommissioning phase, and the cumulative analysis. If these analyses are not substantially different, then they are presented as one discussion.

3.8.2.2 Alternative A: Impacts of the No Action Alternative on Coastal Habitats and Fauna

3.8.2.2.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for coastal habitats and fauna (see Section 3.8.1) would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities and by permitted and constructed offshore wind COP projects within the GAA. These IPFs are described and analyzed in Appendix E1.

3.8.2.2.2 Cumulative Impacts

Onshore Activities and Facilities

This section discloses potential impacts to coastal habitats and fauna associated with future offshore wind development (without the Proposed Action). The cumulative impact analysis for the No Action Alternative for planned non-offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E1.

<u>Climate change</u>: Impacts of climate change could contribute to impacts on coastal habitats and fauna primarily according to existing global and regional climate trends. Activities that contribute to climate change are provided in the Air emissions and climate change section in Section 3.4.1.1. Although sources of GHG emissions contributing to regional and global climate change mostly occur outside the GAA for coastal habitats and fauna, these resources may be affected by climate change, sea level rise, more frequent and intense storms, and altered habitat. Although the impacts resulting from climate change on coastal habitats and fauna are uncertain, BOEM anticipates that future offshore wind activities, without the Proposed Action, could have **negligible** adverse impacts on onshore coastal habitats and fauna.

<u>Presence of structures:</u> In addition to electrical infrastructure, some habitat conversion may result from port expansion activities required to meet the demands for fabrication, construction, transportation, and installation of wind energy structures as well as onshore substations and associated facilities. The general trend along the coastal region from Virginia to Maine is that port activity will increase modestly and require some conversion of undeveloped land to meet port demand and will result in permanent loss of forested habitat for local bat populations. However, the increase from future offshore wind development would be a minimal contribution in the port expansion required to meet increased commercial, industrial, and recreational demand (BOEM 2019). The current bearing capacity of existing ports is considered suitable for wind turbines, requiring no port modifications for supporting offshore wind energy development (DOE 2014). Land disturbance for construction of onshore substations, associated facilities, and port expansion activities in the GAA is expected to result in **negligible** to **minor** adverse impacts to coastal habitat and fauna.

3.8.2.2.3 Conclusions

Under the No Action Alternative, coastal habitats and fauna would continue to follow current regional trends and respond to current and future environmental and societal activities. The current state of local coastal habitat and fauna resources is generally stable, although some fauna may be subject to disturbance from ongoing activities in the GAA. For example, land disturbance from onshore construction of cables and structures periodically causes temporary and permanent habitat loss, temporary displacement, injury, and mortality, resulting in small short-term impacts on certain coastal fauna species. Climate change, influenced in part by GHG emissions, is altering the seasonal timing and patterns of certain species' distribution and ecological relationships, likely causing permanent impacts of unknown intensity. Considering current conditions and the modest pace of development in the GAA, coastal fauna resources are expected to remain generally stable under the No Action Alternative.

BOEM anticipates that the impacts of ongoing activities, especially onshore construction and climate change, would be negligible. In addition to ongoing activities, planned actions other than offshore wind may also contribute to impacts on coastal habitats and fauna. Planned actions other than offshore wind primarily consist of increasing onshore construction, although no future construction projects were identified within the GAA. BOEM anticipates that the impacts of planned actions other than offshore wind would be **negligible** adverse.

If any onshore components of future offshore wind activities overlap the GAA, impacts such as displacement, mortality, and/or habitat loss would be similar to those resulting from the Project alone. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with future offshore wind activities combined with ongoing activities, reasonably foreseeable environmental trends, and planned actions other than offshore wind in the GAA would result in **negligible** to **minor** adverse impacts, primarily through onshore construction (most are attributable to ongoing activities) and climate change.

3.8.2.3 Alternative B: Impacts of the Proposed Action on Coastal Habitats and Fauna

3.8.2.3.1 Construction and Installation

Onshore Activities and Facilities

Climate change: Climate change would contribute to impacts on coastal habitats and fauna primarily according to existing global and regional climate trends. Although sources of GHG emissions contributing to regional and global climate change mostly occur outside the GAA for coastal habitats and fauna, these resources may be affected by climate change, sea level rise, more frequent and intense storms, and altered habitat. The Proposed Action could contribute to a long-term net decrease in GHG emissions. This difference may not be measurable but would help reduce climate change impacts. Although the impacts resulting from climate change on coastal habitats and fauna are uncertain, BOEM anticipates that the Proposed Action would have no measurable influence on climate change and therefore the resulting impacts to coastal habitats and fauna would be **negligible** adverse.

Presence of structures: The OnSS would occupy an operational footprint measuring up to 3.8 acres and would connect to the ICF with two 115-kV underground transmission cables up to 527 feet long. Additionally, the OnSS would include a compacted gravel driveway, stormwater management features, and associated landscaped or managed vegetated areas totaling up to 7.1 acres inclusive of the up-to-4-acre operational footprint of the facility. The adjacent ICF would have an operational footprint of 1.6 acres and would also include a paved access road, stormwater management features, and associated landscaped or managed vegetated areas within the approximate 4.0-acre construction footprint. Construction of these facilities would result in habitat loss and habitat conversion in the areas surrounding the RWEC, the OnSS, and the ICF. The operational footprints of the OnSS and ICF would create habitat loss when forested upland is cleared and replaced with hard structures and crushed gravel yards that are not capable of supporting plants or wildlife. The ICF would result in a loss of approximately 1.6 acres of mixed oak/white pine forest, which is reflective of the operational footprint of the ICF. The OnSS would result in a loss of 3.8 acres of mixed oak/white pine forest. Together, these losses represent a relatively small fraction of the 52 acres of contiguous habitat identified in the RIWAP (Rhode Island DEM et al. 2015) and represent a **negligible** to **minor** adverse impact to coastal habitats.

In addition to impacts on the mixed oak and white pine forest, the OnSS would develop 0.6 acre of pitch pine barren. The OnSS has been designed to avoid occurrences of sickle-leaved golden aster, a plant species of state concern within Rhode Island that were observed within the pitch pine barren outside of the footprint of the OnSS (VHB 2023). In accordance with the state environmental permitting needed for the Project, the occurrence of this state-listed species must be reported to the Rhode Island DEM, which will advise if a mitigation plan will be needed. Overall, the habitat loss that would result from the construction of the OnSS and ICF would be considered negligible because this loss would be small relative to the unimpacted similar habitat in the general region. As previously described in the impacts discussion for the landfall work area, land disturbance and habitat alteration from the construction of the OnSS and ICF could cause habitat degradation through the spread of invasive species. As noted previously, invasive plant growth within the OnSS parcels is pervasive. Invasive plant species were also observed throughout the forested portion of the ICF parcel (VHB 2023). This observation indicates that invasive species are likely to become further established in these areas if proper management techniques are not followed.

3.8.2.3.2 Operations and Maintenance and Decommissioning

Onshore Activities and Facilities

<u>Climate change:</u> No additional impacts from climate change beyond those discussed under the impacts analysis for construction and installation described in Section 3.8.2.2.1 are expected during O&M and Project decommissioning. BOEM anticipates that the Proposed Action would have no measurable influence on climate change and therefore the resulting impacts to coastal habitats and fauna would be **negligible** adverse.

<u>Presence of structures:</u> At the OnSS and ICF, land disturbance in the form of vegetation management would occur on a periodic basis to maintain vegetation at shrub height. Vegetation control methods would employ integrated vegetation management practices, including manual cutting, mowing, the prescriptive use of herbicides, and the use of environmental and cultural controls (Eversource 2018). The method of control would be determined following inspections of the site scheduled for maintenance. The current maintenance cycle for vegetation control using integrated vegetation management practices is 3 or 4 years depending on the vegetation composition, facilities, and site conditions (Eversource 2018). Hazard tree removal would also be performed on a cyclical basis to inspect and remove trees that may fall that are outside the edge of maintained ROWs. Presence of structures as it relates to vegetation clearing may result in the direct injury or mortality of wildlife as well as habitat alteration or removal. Impacts from vegetation management may include reduction in habitat quality via the spread of invasive species and temporary displacement of individuals. However, the spread of invasive species would be controlled with periodic vegetation management, and wildlife displacement could occur only during vegetation removal activities. The impact of habitat degradation and wildlife displacement resulting from vegetation management of the OnSS and ICF is expected to be short term **negligible** adverse.

At the end of the Project's operational life, the OnSS and ICF would be decommissioned in accordance with a detailed Project decommissioning plan that would be developed at that time. OnSS and ICF equipment may be removed while keeping the substation yard and fencing intact. Under such a scenario, land disturbance and habitat alteration activities may be similar to those described under the construction impact analysis, although the impacts would likely be less because new vegetation clearing and grading would not be necessary. The impact of habitat degradation and/or loss, wildlife displacement, and wildlife injury and/or mortality resulting from land disturbance during decommissioning of the OnSS and ICF would be short term **negligible** adverse.

3.8.2.3.3 Cumulative Impacts

Onshore Activities and Facilities

Climate change: The types of cumulative impacts from global climate change to coastal habitats and fauna described under the No Action Alternative would occur under the Proposed Action. However, the Project could also contribute to a long-term net decrease in GHG emissions. This difference may not be measurable but would help reduce climate change impacts (although effects would still be **negligible** to **minor** adverse).

Presence of structures: Construction and installation, O&M, and decommissioning of the OnSS under the Proposed Action would contribute to the habitat conversion and habitat loss described under the No Action Alternative, potentially changing the composition and abundance of faunal assemblages through the removal of forested habitat at the OnSS and ICF. Because of the small amount of affected onshore habitat, land disturbance from the Proposed Action when added to other past, present, and reasonably foreseeable projects would result in **negligible** to **minor** adverse cumulative impacts to coastal habitats and fauna.

3.8.2.3.4 Conclusions

In summary, the activities associated with the Proposed Action may affect coastal habitats and fauna through temporary land disturbance, injury or mortality of individuals, and permanent conversion of a small proportion of the overall habitat available regionally. Considering the avoidance, minimization, and mitigation measures proposed, construction of the Proposed Action alone would likely have **negligible** to **minor** impacts on coastal habitats and fauna. The Proposed Action would contribute to the cumulative impact rating primarily through the temporary displacement, mortality, temporary to permanent habitat loss, and noise generated from construction of the OnSS and ICF. Considering all the IPFs together, BOEM anticipates that the impacts to coastal habitats and fauna from ongoing and planned actions, including the Proposed Action, would likely be **minor** adverse in the GAA because the measurable impacts expected would be small and/or the resource would likely recover completely when the impacting agent is gone and remedial or mitigating action is taken. The main drivers for this impact rating are ongoing and future land disturbance and ongoing climate change.

3.8.2.4 Alternatives C, D, E, and F

Table 3.8-2 provides a summary of IPF findings for these alternatives.

3.8.2.4.1 Conclusions

Considering the avoidance, minimization, and mitigation measures proposed, construction of the Proposed Action alone would likely have **negligible** to **minor** impacts on coastal habitats and fauna. The overall impacts of Alternatives C through F to coastal habitats and fauna when combined with past, present, and reasonably foreseeable activities would be the same as under the Proposed Action: **minor** adverse.

3.8.2.5 Alternative G: Impacts of the Preferred Alternative on Coastal Habitats and Fauna

Table 3.8-2 provides a summary of IPF findings for this alternative.

3.8.2.5.1 Conclusions

Considering the avoidance, minimization, and mitigation measures proposed, construction of t Alternative G alone would likely have **negligible** to **minor** impacts on coastal habitats and fauna. The overall impacts of Alternative G to coastal habitats and fauna when combined with past, present, and reasonably foreseeable activities would be the same as the Proposed Action: **minor** adverse.

3.8.2.6 Mitigation

No mitigation measures resulting from agency consultations for coastal habitats and fauna are identified in Table F-2 in Appendix F.

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3.9 Commercial Fisheries and For-Hire Recreational Fishing (see section in main EIS)

3.10 Cultural Resources (see section in main EIS)

3.11 Demographics, Employment, and Economics (see section in main EIS)

3.12 Environmental Justice (see section in main EIS)

3.13 Finfish and Essential Fish Habitat (see section in main EIS)

3.14 Land Use and Coastal Infrastructure

3.14.1 Description of the Affected Environment and Environmental Consequences of the No Action Alternative for Land Use and Coastal Infrastructure

Geographic analysis area: The GAA for land use and coastal infrastructure includes the town of North Kingstown, Rhode Island, and the ports potentially used for Project construction and installation, O&M, and decommissioning. The ports included as part of the GAA include port facilities and surrounding areas at Sparrow's Point, Paulsboro Marine Terminal, Port of Brooklyn, Port Jefferson, Port of Montauk, Port of New London, Port of Davisville at Quonset Point, Port of Galilee, Port of Providence, and the New Bedford Marine Commerce Terminal. The Proposed Action and other reasonably foreseeable wind energy projects may use the port facilities shown in Figure 3.14.1. Although the extent of port facilities and upgrades are unknown at this time, land use impacts could occur at these 10 port facilities and surrounding areas, which is why they are included in the land use and coastal infrastructure GAA.

The GAA also includes the 18 BOEM OCS lease areas that range from the offshore Norfolk, Virginia, area in the south to the offshore Rhode Island area in the north (see Figure 3.14-1). Appendix E contains detailed descriptions of these port facilities and lease areas. These areas encompass locations where BOEM anticipates direct and indirect impacts associated with proposed onshore facilities and ports.

Affected environment: The town of North Kingstown, one of 10 towns in Washington County, is located south of Providence, Rhode Island, and is bordered on the south by the towns of South Kingstown and Narragansett, on the north by East Greenwich, on the west by Exeter, and on the east by Narragansett Bay. North Kingstown is the second-largest Washington County town, with a population of 26,323 in 2019 (U.S. Census Bureau 2019). It is part of the Providence metropolitan area, with a land area of approximately 58 square miles.

North Kingstown is a primarily residential community characterized by a mixture of farms, natural areas, cultural centers, villages, historic districts and towns, and countryside (Interface Studio 2019). There are several unique points of interest in the town, including the Davis Memorial Wildlife Refuge, Smith's Castle, and Quonset Point, among others. Land use within the town of North Kingstown largely comprises small areas of low-density residential enclaves surrounded by forests, brushland, and pastures. North Kingstown also contains areas with mines, quarries, and gravel pits, as well as industrial and commercial hubs. The waterfront areas of North Kingstown include transportation facilities such as the Port of Davisville at Quonset Point, open space, high-density residential, wetlands, and other uses.

The proposed RWEC landing site would be within the landfall envelope described in the COP (see COP Figure 2.2.1-3), which totals approximately 20 acres, located at the Port of Davisville at Quonset Point in North Kingstown (see COP Figure 1.1-1). The landfall envelope is generally bounded by Whitecap Drive on the west, the Electric Boat property on the east, and Circuit Drive on the north. Within the landfall envelope is a landfall work area measuring up to 3.1 acres. The landfall work area is part of the Port of Davisville at Quonset Point, which is the location of the former Naval Air Station Quonset Point. The landfall work area consists of several onshore elements:

- Up to two underground transmission circuits (called the onshore transmission cable), co-located within a single corridor
- An OnSS and ICF located adjacent to the existing Davisville Substation

- An underground ROW connecting the OnSS to the ICF (Interconnection ROW)
- An overhead ROW connecting the ICF to the Davisville Substation (TNEC ROW)

Land uses in the landfall envelope are primarily commercial and industrial. This area of the Port of Davisville at Quonset Point is part of the Quonset Business Park and contains several large businesses, including boat and pool manufacturers, medical laboratories, distribution centers, lumber distributors, and office space, among others (*SO Rhode Island* 2014). The landfall envelope area contains a few manufacturing and industrial buildings, associated parking lots, and access roads. Blue Beach, a public beach, is approximately 500 feet west of the southwest corner of the landfall envelope. Blue Beach is accessed via a trail located to the west of the Hayward Industries, Inc., building, which is just outside the landfall envelope. Compass Rose Beach, another public beach, is approximately 2,600 feet east of the southeast corner of the landfall envelope. The Martha's Vineyard Fast Ferry dock is located directly east of Compass Rose Beach. The eastern edge of the Quonset State Airport is also approximately 2,600 feet east of the landfall envelope. The North Kingstown Golf Course is approximately 2,000 feet north of the northern edge of the landfall envelope and is separated from the landfall envelope by Roger Williams Way.

Regardless of the landfall site selected, the preferred onshore transmission cable route is an approximate 1-mile (1.6-km) route that would predominantly follow along paved roads or previously disturbed areas such as parking lots. There are alternative onshore transmission cable routes under consideration within the onshore transmission cable envelope, as depicted on Figure 4.3.1-2 in the COP. Some of the routes under consideration have segments that would be installed in undeveloped, vegetated areas within parcels 179-003 and 179-005 (the Davisville Substation parcel), although most would be installed within paved roads and parking lots, as with the preferred onshore transmission cable route, and would be approximately the same length. Regardless of the exact route chosen, impact determinations would not be affected for any IPF (COP Figure 4.3.1-2). Land uses around the onshore Project footprint consist of low-density residential, commercial, and public lands on the south side of Camp Avenue, and other commercial and industrial uses. There are two public beaches in the Project vicinity, Blue Beach and Compass Rose Beach, as well as three small schools. Based on the Town of North Kingstown's Assessors' Data (Interface Studio 2019), the segment of the RWEC from the mean high water level to the transition joint bays (TJBs), landfall work area, and onshore transmission cable are located within an area that is predominantly industrial but also consists of some large business commercial, low-medium residential (including single-family residences and duplexes), and undeveloped land uses. The property hosting the OnSS and ICF is surrounded by low-medium residential, medium-high-density residential, utility (i.e., the existing Davisville Substation), and undeveloped land uses. The OnSS would be located on two adjacent parcels (179-030 and 179-001) totaling 15.7 acres, both owned by the Rhode Island Commerce Corporation. The ICF would be located on an adjacent 6.1-acre parcel (179-005) owned by TNEC. COP Figure 4.6.7-1 (VHB 2023a) depicts land uses near the onshore components of the Project.

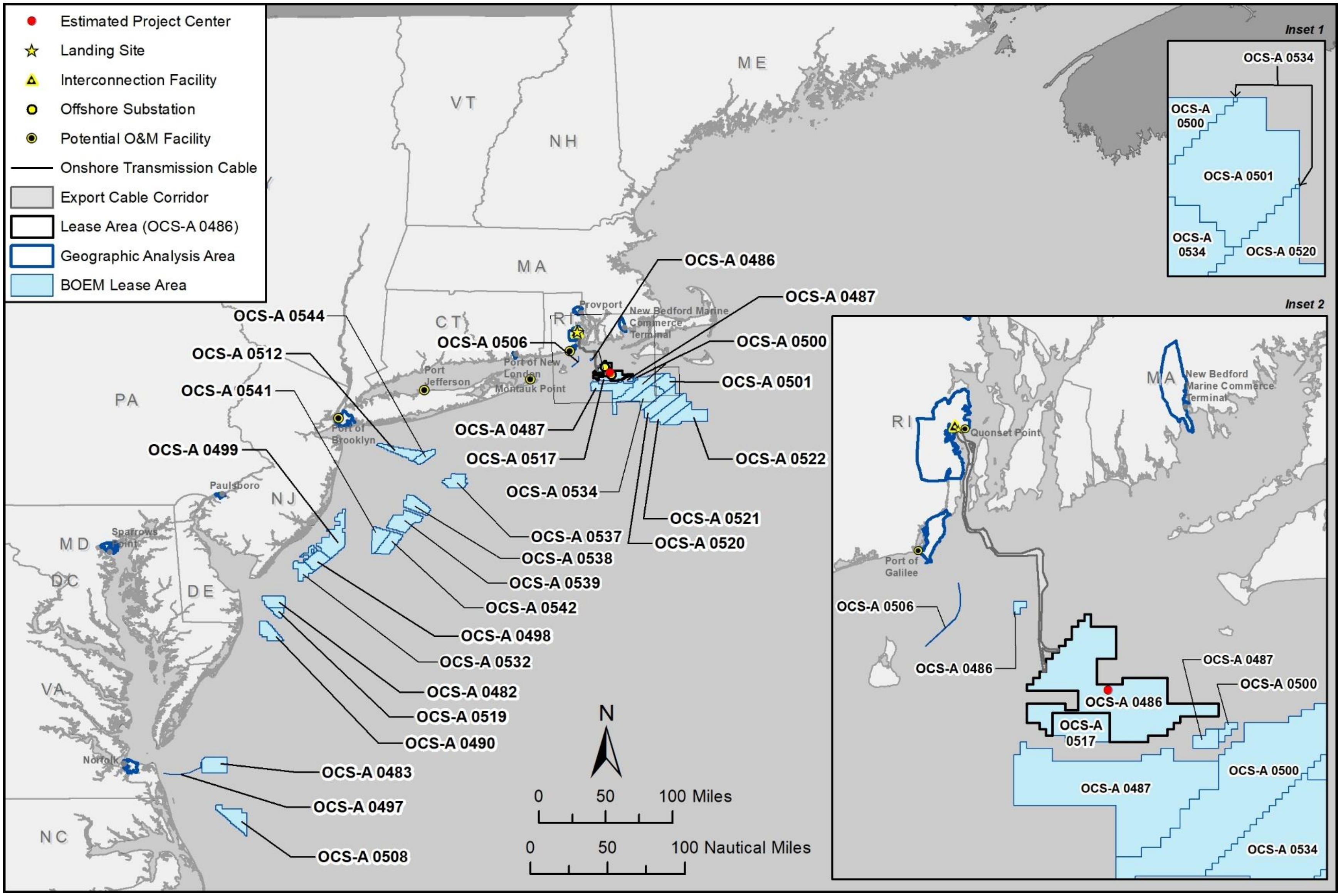

Figure 3.14-1. Geographic analysis area for land use and coastal infrastructure.

An OnSS and ICF would be constructed to support interconnection to the existing Davisville Substation, which is located within the Quonset Business Park in North Kingstown. The Davisville Substation operates at 115 kV and connects to the regional transmission grid via two 115-kV transmission tap lines. The existing substation is within North Kingstown Assessor’s Plat 179 Lot 005. The OnSS location is on the north side of Camp Avenue in an undeveloped area. The Town of North Kingstown has designated the undeveloped area as a planned village development that is surrounded by the Quonset Business Park District (Town of North Kingstown, Rhode Island 2021a). The RWEC would enter the landfall work area underground, pass through the TJBs, and continue underground as the onshore transmission cable to the OnSS. The connection cables running from the OnSS to the ICF would be underground. The cables connecting from the ICF to the existing Davisville Substation would be the only aboveground and overhead cables (VHB 2023a).

The Port of Davisville at Quonset Point, a port located in North Kingstown, is a former naval air station that was subsequently redeveloped into a modern industrial park (Interface Studio 2019). The industrial park, known as Quonset Point/Davisville Business Park, is on a peninsula in Narragansett Bay. The port is a multimodal transportation area with deepwater piers used for both shipping and ship repairs, an airport with the longest runway in the state, freight and passenger rail facilities, and interstate highway connections. The availability of a variety of industrially zoned land with full-service networks provides opportunities for new industries (Maguire Group, Inc. 2008). The Port of Davisville at Quonset Point is served by Rhode Island Route 403 and a railroad spur from Amtrak’s Northeast Corridor, along with freight service provided by the Providence and Worcester Railroad. It is also the home of the Port of Davisville at Quonset Point, a golf course, four public beaches, ferry service to Martha’s Vineyard, and two museums.

Other port facilities in New York, Rhode Island, Connecticut, Virginia, Massachusetts, Maryland, and New Jersey could also support construction of the RWF and offshore components of the RWEC (see COP Table 3.3.10-1). These ports are generally industrial in character and are typically adjacent to other industrial or commercial land uses and major transportation corridors. Before construction begins, Revolution Wind would finalize mobilization plans and arrangements at port facilities to support Proposed Action activities, including logistic support for fabrication, as needed (VHB 2023a). See Section 3.9, Section 3.11, and Section 3.18 for discussions of recreational vessel and commercial fishing activity in these ports.

3.14.2 Environmental Consequences

3.14.2.1 Relevant Design Parameters, Impact-Producing Factors, and Potential Variances in Impacts

The analysis presented in this section considers the impacts resulting from the maximum design scenario under the PDE approach developed by BOEM to support offshore wind project development (Rowe et al. 2017). The maximum design size specifications defined in Appendix D, Table D-1, are PDE parameters used to conduct this analysis. Several project parameters could change during the development of the final project configuration, potentially reducing the extent and/or intensity of impacts resulting from the associated IPFs.

The following design parameters would result in reduced impacts relative to those generated by the design elements considered under the PDE:

- The use of a casing pipe method to construct the RWEC sea-to-shore transition would eliminate the need for a temporary cofferdam, resulting in less extensive acoustic and vibration impacts than vibratory pile driving to construct a cofferdam thus reducing onshore noise and vibration impacts to coastal land uses (Zeddies 2021).
- The selection of an 8-MW WTG design would reduce the total WTG height from 873 to 648 feet, reducing the visual impact of the facility on coastal land uses.
- The selection of an alternate route for the onshore component of the RWEC could alter the location and increase or decrease the extent of construction-related ground disturbance, but the nature and overall significance of these impacts on land use would remain unchanged.

See Appendix E2 for a summary of IPFs analyzed for land use and coastal resources across all action alternatives. IPFs that are either not applicable to the resource or determined by BOEM to have a negligible adverse effect are excluded from Chapter 3 and provided in Appendix E1, Table E2-13. Offshore and onshore IPFs are addressed separately in the analysis if appropriate for the resource; not all IPFs have both an offshore and onshore component. Where feasible, calculations for specific alternative impacts are provided in Appendix E4, to facilitate reader comparison across alternatives.

Table 3.14-1 provides a summary of IPF findings carried forward for analysis. Each alternative analysis discussion consists of the construction and installation phase, the O&M phase, the decommissioning phase, and the cumulative analysis. If these analyses are not substantially different, then they are presented as one discussion. This comparison considers the implementation of all EPMs proposed by Revolution Wind to avoid and minimize adverse impacts on land use. These EPMs are summarized in Appendix F, Table F-1.

A detailed analysis of the Proposed Action is provided following the table. A detailed analysis of other considered action alternatives is also provided below the table if the analysis indicates that the alternative(s) would result in substantially different impacts than the Proposed Action. Offshore and onshore IPFs are addressed separately in the analysis if appropriate for the resource; not all IPFs have both an offshore and onshore component.

The Conclusion section within each alternative analysis discussion includes rationale for the effects determinations. Overall, impacts to land use and coastal infrastructure from any action alternative would be **minor** adverse because they would be small, and the resource would be expected to recover completely with no mitigating action required.

Table 3.14-1. Alternative Comparison Summary for Land Use and Coastal Infrastructure

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
Accidental releases and discharges	**Offshore**: Future offshore activities could result in accidental releases of trash or water quality contaminants (see Section 3.21 for quantities and details). These impacts, however, would generally be localized and short term. On this basis, the effects of accidental releases and discharges on land use under the No Action Alternative would be long term and **minor** adverse.	**Offshore**: Accidental releases and discharges of fuels, lubricants, and hydraulic fluids could occur during the construction and installation phase. Accidental releases would be minimized by containment and cleanup measures detailed in the emergency response plan/OSRP. Therefore, there would be a **negligible** adverse impact from accidental releases and discharges on land use and coastal infrastructure. The Proposed Action and other reasonably foreseeable projects would be expected to comply with any applicable permit requirements to implement erosion, stormwater, and spill controls to minimize, reduce, or avoid impacts on water and air quality. As a result, the Proposed Action when combined with past, present, and other reasonably foreseeable projects would result in **negligible** adverse cumulative impacts on land use and coastal infrastructure because there would be no impact on land use and coastal infrastructure.	**Offshore**: Alternative C to F would require fewer vessel trips relative to the Proposed Action, reducing the risk of accidental releases and discharges from vessels. However, given the likelihood of such releases is low, the difference in level of risk would likely be undetectable. Likewise, risk of accidental releases and discharges could be slightly reduced from the reduced risk of vessel collisions/allisions. Because accidental releases and discharges in the offshore environment of the scale anticipated are not expected to measurably impact land use and coastal infrastructure, these impacts would similarly be **negligible** adverse.				**Offshore**: Alternative G would require fewer vessel trips relative to the Proposed Action, reducing the risk of accidental releases and discharges from vessels. However, given the likelihood of such releases is low, the difference in level of risk would likely be undetectable. Likewise, risk of accidental releases and discharges could be slightly reduced from the reduced risk of vessel collisions/allisions. Because accidental releases and discharges in the offshore environment of the scale anticipated are not expected to measurably impact land use and coastal infrastructure, these impacts would similarly be **negligible** adverse.
	Onshore: Future onshore activities could result in accidental releases of trash or water quality contaminants (see Section 3.21 for quantities and details). These impacts, however, would generally be localized and short term. On this basis, the effects of accidental releases and discharges on land use under the No Action Alternative would be long term and **minor** adverse.	**Onshore**: Although accidental releases and discharges could impact land use and coastal infrastructure by introducing air or water quality contamination into areas undergoing construction and installation, O&M and decommissioning, it is anticipated that containment would prevent or mitigate discharges before they can impact land uses. Therefore, there would be a temporary, **negligible** adverse impact due to accidental releases and discharges on land use and coastal infrastructure.	**Onshore**: Alternatives C through F would consist of the same onshore facilities and activities as the Proposed Action. Therefore, onshore impacts to land use and coastal infrastructure from accidental releases and discharges would be the same as the Proposed Action: **negligible** adverse.				**Onshore**: Alternative G would consist of the same onshore facilities and activities as those described for the Proposed Action. Therefore, onshore impacts to land use and coastal infrastructure from accidental releases and discharges would be the same as the Proposed Action: **negligible** adverse.
Light	**Offshore**: Permanent aviation warning lighting on any offshore wind WTGs proposed as part of future offshore wind activities would be visible from south-facing beaches and coastlines. However, land use would not be expected to be measurably changed, nor would light itself impact land uses or alter land use patterns. On this basis, the effects of light on land use under the No Action Alternative would be long term and **minor** adverse.	**Offshore**: There would be a temporary increase in the amount of lighting during construction and installation due to the presence of work vessels. Given that offshore elements of the Proposed Action would be located approximately 12 to 15 miles from shore, it is anticipated that there would be very little lighting impact on land use and coastal infrastructure from construction and installation of offshore elements of the Proposed Action. Therefore, there would be a temporary, **negligible** adverse light impact on land use and coastal infrastructure.	**Offshore**: Although Alternatives C through F could result in a slight reduction in construction lighting, the effects of this IPF on land use and coastal infrastructure would otherwise be similar to the Proposed Action, ranging from **negligible** adverse to **minor** adverse.				**Offshore:** Although Alternative G could result in a slight reduction in construction lighting, the effects of this IPF on land use and coastal infrastructure would otherwise be similar to the Proposed Action, ranging from **negligible** adverse to **minor** adverse.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
		During operations, offshore structures would require lighting that conforms to FAA and BOEM guidelines, and USCG requirements. The visibility of WTGs and potentially the OSSs would result in a small impact to onshore land uses and coastal infrastructure by increasing light in the offshore environment that could be visible onshore and could slightly increase visible light in coastal communities. Decommissioning impacts would be similar to impacts from the Proposed Action construction and installation. Therefore, there would be a long-term, **minor** adverse light impact on land use and coastal infrastructure from O&M and decommissioning of offshore elements of the Proposed Action. The Proposed Action and other reasonably foreseeable projects would be expected to comply with applicable permit conditions and lighting requirements to minimize, reduce, or avoid light impacts on onshore land uses and coastal infrastructure. Therefore, the cumulative impact would be **negligible** adverse.					
	Onshore: Future offshore activities could result in onshore lighting associated with supporting infrastructure for offshore wind development. These lighting sources would be minor adverse and short term in nature. On this basis, the effects of light on land use under the No Action Alternative would be long term and **minor** adverse**.**	**Onshore**: Nighttime lighting could have a temporary adverse impact on land use and coastal infrastructure by increasing artificial lighting that could be visible by residences and businesses nearby. Operational lighting onshore would be limited to the OnSS and ICF. In general, lighting would be minimal and directed downward. Lighting would be removed as part of decommissioning. Therefore, there would be a long-term, **minor** adverse light impact on land use and coastal infrastructure from construction, O&M, and decommissioning of onshore elements of the Proposed Action. Temporary and permanent lighting would require compliance with local development regulations at the port facilities and locations where reasonably foreseeable future projects would experience onshore lighting impacts. Therefore, cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **minor** adverse on land use and coastal infrastructure.	**Onshore:** Alternatives C through F would consist of the same onshore facilities and activities as the Proposed Action. Therefore, onshore impacts to land use and coastal infrastructure from lighting would be the same as the Proposed Action: **minor** adverse.				**Onshore**: Alternative G would consist of the same onshore facilities and activities as the Proposed Action. Therefore, onshore impacts to land use and coastal infrastructure from lighting would be the same as the Proposed Action: **minor** adverse.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
New Cable Emplacement/Maintenance	**Onshore**: Future offshore activities could result in onshore land disturbances to accommodate supporting cable infrastructure for offshore wind development. Onshore, neighboring or adjacent land to cable placement could also temporarily be disturbed by future offshore wind project–related noise, vibration, and dust, as well as travel delays along impacted roads. All construction and operational impacts from land disturbance would be regulated through local land use and zoning regulations and would therefore comply with applicable laws. On this basis, the effects of land disturbance on land use under the No Action Alternative would be short term and **negligible** adverse.	**Onshore**: All Proposed Action–related construction and installation would take place within areas zoned for industrial and commercial development and would be subject to land use and zoning regulations that limit impacts. Therefore, there would be a short-term, **minor** adverse land disturbance impact on land use and coastal infrastructure. Once installed, the onshore components of the RWEC would be located underground and disturbed areas would be restored to preconstruction conditions or improved. Due to the temporary and intermittent nature of O&M activities, O&M of onshore facilities would have a **negligible** adverse impact on land use over the 35-year lifespan of the Project. The Project and other reasonably foreseeable future projects would be required to comply with local land use and zoning regulations, which would reduce impacts to land use and coastal infrastructure. Therefore, cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable future activities would be **minor** adverse on land use and coastal infrastructure.	**Onshore**: Alternatives C through F would consist of the same onshore facilities and activities as those planned under the Proposed Action. Therefore, onshore impacts to land use and coastal infrastructure from new cable emplacement/maintenance would be the same as the Proposed Action, ranging from **negligible** adverse to **minor** adverse.				**Onshore**: Alternative G would consist of the same onshore facilities and activities as the Proposed Action. Therefore, onshore impacts to land use and coastal infrastructure from new cable emplacement/maintenance would be the same as the Proposed Action, ranging from **negligible** adverse to **minor** adverse.
Noise	**Offshore**: Future offshore wind activities could result in increased noise during the construction and installation phases. These noise impacts would be subject to state and local noise regulations and ordinances. On this basis, the effects of noise on land use under the No Action Alternative would be long term and **negligible** adverse.	**Offshore**: Although offshore noise associated with the Proposed Action construction could be audible onshore, it would be below ambient noise levels and therefore would have a minimal impact on land use and coastal infrastructure. Therefore, there would be a temporary, **negligible** adverse noise impact on land use and coastal infrastructure. There would be no noise impacts on land use and coastal infrastructure from O&M of offshore facilities. Therefore, the impact on land use and coastal infrastructure from O&M and decommissioning of offshore elements of the Proposed Action would be **negligible** adverse. Noise associated with the Project and reasonably foreseeable offshore wind activities are not expected to generate noise levels that would be audible onshore. Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and	**Offshore**: Under Alternatives C through F, fewer monopiles would be constructed and installed. Although Alternatives C through F could result in a slight reduction in construction noise, the effects of this IPF on land use and coastal infrastructure would otherwise be similar to the Proposed Action. Therefore, the impact on land use and coastal infrastructure would be **negligible** adverse, which is the same impact determination as the Proposed Action.				**Offshore**: Under Alternative G, fewer monopiles would be constructed and installed. Although this alternative could result in a slight reduction in construction noise, the effects of this IPF on land use and coastal infrastructure would otherwise be similar to the Proposed Action. Therefore, the impact on land use and coastal infrastructure would be **negligible** adverse.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
		reasonably foreseeable activities would be **negligible** adverse.					
	Onshore: Future offshore activities could result in onshore noise associated with clearing and grading, construction and installation of aboveground and underground utility infrastructure and impervious surfaces, and other disturbances. These noise sources would be **minor** adverse and short term in nature.	**Onshore**: Noise and traffic would result from construction and installation of the onshore facilities. EPMs would minimize, but not eliminate, noise effects on surrounding land uses. However, these effects would be short term and generally consistent with noise impacts associated with general development under zoned land uses (VHB 2023b). Therefore, there would be short term, **minor** adverse noise impact on land use and coastal infrastructure from construction and installation of onshore elements of the Proposed Action. Noise generated by onshore facilities and O&M and decommissioning activities would be managed under existing local ordinances and regulations as permitted for the approved zoning. As such, noise impacts on land use from the O&M and decommissioning of onshore facilities would have a **negligible** adverse effect on land use. It is expected that noise impacts generated by other planned and foreseeable future actions would similarly be consistent with local ordinances applicable to zoned land uses. Therefore, cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would have a **negligible** adverse effect on land use and coastal infrastructure.	**Onshore**: Alternatives C through F would consist of the same onshore facilities and activities as those planned under the Proposed Action. Therefore, onshore impacts to land use and coastal infrastructure from noise would be the same as the Proposed Action, ranging from **negligible** adverse to **minor** adverse.				**Onshore**: Alternative G would consist of the same onshore facilities and activities as the Proposed Action. Therefore, onshore impacts to land use and coastal infrastructure from noise would be the same as the Proposed Action, ranging from **negligible** adverse to **minor** adverse.

3.14.2.2 Alternative A: Impacts of the No Action Alternative on Land Use and Coastal Infrastructure

3.14.2.2.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for land use and coastal infrastructure (see Section 3.14.1) would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities and by permitted and constructed offshore wind COP projects within the GAA. These IPFs are described and analyzed in Appendix E1.

3.14.2.2.2 Cumulative Impacts

This section discloses potential land use and coastal infrastructure impacts associated with future offshore wind development (without the Proposed Action). The cumulative impact analysis for the No Action Alternative for planned non-offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E2.

Accidental releases and discharges: Future offshore and onshore activities could result in accidental releases of trash or water quality contaminants (see Section 3.21 for quantities and details). Trash and contaminant spills would be minimized by vessel compliance with USCG regulations. In the event of a spill, adjacent properties and coastal infrastructure could be temporarily restricted. The exact extent of restrictions and other impacts would depend on the locations of landfall, substations, and cable routes, as well as the ports used to support future offshore wind energy projects. These impacts, however, would generally be localized and short term. On this basis, the effects of accidental releases and discharges on land use under the No Action Alternative would be long term and **minor** adverse.

New cable emplacement/maintenance: Future offshore activities could result in onshore land disturbances to accommodate supporting cable infrastructure for offshore wind development. Land disturbance impacts would largely be limited to the construction and installation phase of any such projects and would be localized in nature.

Onshore, neighboring or adjacent land to cable placement could temporarily be disturbed by future offshore wind project–related noise, vibration, and dust, as well as travel delays along impacted roads. The simultaneous construction and installation of two or more onshore development projects and/or landing sites and onshore cable routes would generate cumulative short-term impacts to land use. State and local agencies would be responsible for managing actions to help minimize and avoid noise, air quality, and other impacts on nearby neighborhoods during construction and installation. All construction and operational impacts from land disturbance would be regulated through local land use and zoning regulations and would therefore comply with applicable laws. On this basis, the effects of land disturbance on land use under the No Action Alternative would be short term and **negligible** adverse**.**

Light: Future offshore activities could result in onshore lighting associated with supporting infrastructure for offshore wind development. These lighting sources would be minor adverse and short term in nature. All construction and operational impacts from land disturbance would be regulated through local land use and zoning regulations and would therefore comply with applicable laws. On this basis, the effects of light on land use under the No Action Alternative would be long term and **minor** adverse**.**

Permanent aviation warning lighting on any offshore wind WTGs proposed as part of future offshore wind activities would be visible from south-facing beaches and coastlines. Visibility would depend on distance from shore, topography, and atmospheric conditions but would be long term. If this lighting alters visitor behavior, land use in the form of tourism, recreation, and property values could subsequently be impacted. Lighting from substations could also affect the adjacent property use and residential development. However, new substations constructed as part of future offshore wind activities would likely be constructed near existing energy infrastructure or where land development regulations, such as zoning and land use plan designations, allow such uses. Therefore, land use would not be expected to be measurably changed, nor would light itself impact land uses or alter land use patterns. On this basis, the effects of light on land use under the No Action Alternative would be long term and **minor** adverse**.**

<u>Noise:</u> Future offshore activities could result in onshore noise associated with clearing and grading, construction and installation of aboveground and underground utility infrastructure and impervious surfaces, and other disturbances. These noise sources would be **minor** adverse and short term in nature.

Future offshore wind activities could result in increased noise during the construction and installation phases. Given the location of these projects within the RI/MA WEA (see Figure 1.1-2), there would be no noise impacts on land use from construction and installation, O&M, and decommissioning of the offshore components of future offshore wind activities. Future offshore wind activities could result in onshore noise impacts during construction and installation, O&M, and decommissioning of onshore elements of future offshore wind activities due to increased construction, traffic, dust, vibration, and other impacts. These noise impacts would be subject to state and local noise regulations and ordinances and therefore would have limited adverse impacts on land use due to the impacts occurring under regulatory thresholds. On this basis, the effects of noise on land use under the No Action Alternative would be long term and **negligible** adverse.

3.14.2.2.3 Conclusions

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and decommissioning would not occur; and potential impacts on land use and coastal infrastructure associated with the Project would not occur. However, ongoing and future offshore wind activities would have continuing temporary to long-term impacts on land use and coastal infrastructure, primarily through onshore construction and installation and port activities.

BOEM anticipates that impacts for reasonably foreseeable offshore wind activities would be **minor** adverse. Impacts for ongoing activities and reasonably foreseeable activities other than offshore wind would be **minor** adverse, as discussed in Appendix E, Table E2-13. Accidental releases, electromagnetic fields (EMF), land disturbance, light, noise, and port utilization could have temporary adverse impacts on local land uses, but as a whole, ongoing use and development would support the region’s diverse mix of land uses and provide support for continued maintenance and improvement of coastal infrastructure.

Considering all the IPFs together, BOEM anticipates that the impacts associated with future offshore wind activities in the GAA, combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind, would result in **minor** adverse impacts because the overall effect would be localized and short term.

3.14.2.3 Alternative B: Impacts of the Proposed Action on Land Use and Coastal Infrastructure

3.14.2.3.1 Construction and Installation

Offshore Activities and Facilities

Accidental releases and discharges: Accidental releases and discharges of fuels, lubricants, and hydraulic fluids could occur during the construction and installation phase. These impacts are covered in Section 3.21. A draft OSRP has been prepared for the Project and consists of processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. A release during construction and installation of the Proposed Action would generally be localized, short term, and **minor** adverse, resulting in little change to water quality.

Offshore accidental releases and discharges during construction and installation would not result in land use and coastal infrastructure impacts, as incorporation of water quality EPMs described in Appendix F would aid in reducing the chances of accidental releases and discharges; accidental releases and discharges would be contained and mitigated according to federal, state, and local law. Applicable EPMs in Appendix F include compliance with regulatory requirements related to the prevention and control of spills and discharges, implementation of an OSRP to manage accidental spills or releases of oils or other hazardous materials, and compliance with USCG and EPA regulations. Therefore, potential offshore accidental releases and discharges would be unlikely to result in onshore land use and coastal infrastructure impacts, as these impacts would be mitigated prior to any impacts affecting onshore resources. Therefore, there would be a **negligible** adverse impact from accidental releases and discharges on land use and coastal infrastructure during construction and installation of offshore elements of the Proposed Action, as there would be no effect from offshore accidental releases and discharges on land use and coastal infrastructure.

Light: There would be a temporary increase in the amount of lighting during construction and installation due to the presence of work vessels. In general, lights would be required on offshore platforms and structures, vessels, and construction equipment during construction and installation of the RWF. In addition, temporary work lighting would illuminate work areas on vessel decks or service platforms of adjacent WTGs or OSS platforms during nighttime construction. Project construction lighting would meet USGS requirements, when required by federal regulations.

The RWEC would also require USCG-approved navigation lighting for all vessels during construction and installation of the RWEC. All vessels operating between dusk and dawn would be required to turn on navigation lights. Cable laying could occur 24 hours a day during certain periods, and these vessels would be illuminated at night for safe operations. Given that offshore elements of the Project would be located approximately 12 to 15 miles from shore, it is anticipated that there would be very little lighting impact on land use and coastal infrastructure from construction and installation of offshore elements of the Project. Therefore, there would be a temporary, **negligible** adverse light impact on land use and coastal infrastructure from construction and installation of offshore elements of the Proposed Action.

Noise: Construction and installation of offshore elements of the Project would result in increased noise. The proposed Project would be approximately 15 miles west of the town of New Shoreham, Rhode Island, (Block Island) and 15 to 20 miles south of several other coastal towns in Rhode Island including South Kingstown, Narragansett, Jamestown, Newport, Middletown, and Little Compton. The Project would be approximately 12 miles east/southeast of Martha's Vineyard, Massachusetts, and 13 to 16 miles south of other coastal towns in Massachusetts such as Westport, Dartmouth, and Gosnold. The maximum pile-driving noise from construction and installation of offshore Project elements audible from coastal towns would be 11.2 dBA, which is below ambient noise levels at towns in the vicinity, which range from 25 to 45 dBA during the night and 35 to 55 dBA during the day (VHB 2020). Although offshore noise associated with the Proposed Action could be audible onshore, it would be below ambient noise levels and therefore would have a minimal impact on land use and coastal infrastructure. Therefore, there would be a temporary, **negligible** adverse noise impact on land use and coastal infrastructure from construction and installation of offshore elements of the Proposed Action.

Onshore Activities and Facilities

<u>Accidental releases and discharges:</u> Installation of the RWEC at the landfall location would use an HDD approach to install the cables under the beach and intertidal water areas. The use of drilling fluid, which typically consists of a water and bentonite mud mixture or another non-toxic drilling fluid, would be required. Bentonite is a natural clay that is mined from the earth. Although these fluids are considered non-toxic, Revolution Wind would implement applicable EPMs listed in Appendix F during construction to minimize potential releases of the drilling fluid associated with HDD activities.

Solid wastes and construction debris would be generated predominately during construction and installation of onshore facilities. Per requirements outlined in 30 CFR 585.626, maximum quantities of and disposal methods for liquids and solid wastes, including hazardous materials, are summarized in COP Section 3.3.9.4 for construction. COP Table 3.3.1-2 also outlines maximum quantities of disposal methods for liquids and solid wastes, including hazardous materials for the OnSS. A spill prevention control and countermeasures plan would be developed in support of NPDES compliance and the potential for discharges and releases from onshore construction and installation would be governed by Rhode Island regulations and the Project's COP. It is anticipated that construction and installation of the OnSS would generate approximately 3,000 cy of solid waste that would be disposed of in a landfill and/or recycling center (VHB 2023a).

In accordance with applicable federal, state, and local laws, comprehensive measures would be implemented prior to and during construction and installation activities to avoid, minimize, and mitigate impacts related to trash and debris disposal. Construction and installation of onshore elements could result in accidental releases and discharges of solid wastes and construction debris that could impact land use; however, the Project would implement applicable EPMs (see Appendix F) and comply with federal, state, and local regulations to reduce the impacts to land use and coastal infrastructure. Some of the EPMs listed in Appendix F include containing drilling fluids for later reuse, creating an HDD contingency plan and SESC plan, and compliance with the RIPDES General Permit for Stormwater Discharges associated with Construction Activities.

Although accidental releases and discharges could impact land use and coastal infrastructure by introducing air or water quality contamination into areas undergoing construction and installation, containment measures outlined above would prevent or mitigate discharges before they can impact land uses. Therefore, there would be a temporary, **negligible** adverse impact due to accidental releases and discharges on land use and coastal infrastructure from construction and installation of onshore elements of the Proposed Action.

New cable emplacement/maintenance: Airborne noise, vibration and dust, and increased vehicle traffic associated with construction and installation of the RWEC landing site and onshore export cable components would temporarily disturb neighboring land uses along the RWEC route. Portions of the development footprint could also be fenced and inaccessible at various points during construction and installation. Construction and installation activities causing these impacts consist of HDD for the RWEC, preparation and installation of TJBs that connect the RWEC and onshore transmission cable, and installation of the onshore transmission cable.

The onshore transmission cable would be installed within an underground duct bank between the TJBs and the OnSS and would be installed within or along previously disturbed areas including the shoulders of existing public roadways, lands owned by Quonset Development Corporation, and private properties. The onshore transmission cable would result in 3.1 acres (1.3 hectares) of land disturbance but would be located outside wetlands and other waterbodies. The landfall work area would require clearing, grading, and hardening to support the installation of the TJBs and would temporarily result in up to 3.1 acres (1.3 ha) of land disturbance. The TJBs would be excavated and installed underground within the landfall work area and access inside the TJBs would be provided by manholes. Therefore, land disturbance associated with the TJB area would be temporary. As discussed above, the onshore transmission cable, landfall work area, and TJBs would result in temporary impacts only. In addition, work would be sited in uplands and all activities would be conducted in compliance with the RIPDES General Permit for the Discharge of Stormwater Associated with Construction Activities and an approved SESC plan. Therefore, with the implementation of the EPMs outlined in Appendix F, land disturbance activities during construction and installation of the onshore transmission cable are expected to result in direct and short-term water quality impacts (VHB 2023a).

Construction and installation of the Project's onshore components would require construction staging in parking lots adjacent to or near the landing site. Although most of the construction staging would occur on private property, construction could reduce public parking available at the Blue Beach parking lot during construction and installation. These disturbances would be short term, with construction expected to begin in Quarter 1 of 2023 and last approximately 8 months (see COP Section 3.2). Construction along public roadways would be completed in a matter of days or weeks. At the landing site, the Project would make the physical connection between the offshore RWEC and the onshore RWEC in two underground TJBs. The only long-term, visible components of the cable system would be the manhole covers (VHB 2023c).

Onshore construction and installation would include trench excavation and placement of the onshore RWEC within existing paved roads. Revolution Wind would abide by local construction ordinances. Construction and installation would occur primarily during normal daylight hours except for certain activities associated with cable installation at the chosen landing site (VHB 2023c) that could require nighttime activity to meet rapid construction timelines and to reduce the chances of equipment failure. Revolution Wind would work with the Town of North Kingstown to develop a detailed plan that includes traffic and other control measures prior to beginning major construction. The traffic plan with North Kingstown would identify appropriate alternative routes that would accommodate projected traffic loading during construction and installation activities. BOEM assumes that the Project would avoid permanent disruption to existing underground utilities, such as water, sewer, and electrical lines. However, depending on the exact placement of the onshore RWEC cable, the physical size and location of the cable could hamper future installation of public utilities such as water, sewer, and stormwater lines, which are typically placed beneath roadway travel lanes. Vehicular and construction equipment emissions would be similar to those described for offshore development. The potential impacts from construction and diesel-generating equipment would be reduced through EPMs related to fuel-efficient engines and dust control plans, as outlined in Section 3.4.1.

All Project-related construction and installation would take place within areas zoned for industrial and commercial development and would be subject to land use and zoning regulations that limit impacts. Therefore, there would be a short-term, **minor** adverse land disturbance impact on land use and coastal infrastructure from construction and installation of onshore elements of the Proposed Action.

Light: Most onshore construction and installation would be completed during daytime hours. Typical construction work hours for the Project would be 7:00 a.m. to 6:00 p.m. Monday through Friday when daylight permits and 7:00 a.m. to 5:00 p.m. on Saturdays. This is consistent with the Town of North Kingstown noise ordinance (Town Code Article VI). However, some work tasks, such as concrete pours, landfall installation, and cable pulling or splicing, once started, require completion without interruption and could go beyond normal work hours. In addition, the nature of transmission line construction and installation requires line outages for certain procedures such as transmission line connections, equipment cutovers, or stringing under or over other transmission lines. These outages are dictated by ISO New England and can be very limited based on regional system load and weather conditions. Work requiring scheduled outages and crossings of certain transportation and utility corridors may be required on a limited basis outside of normal work hours, including Sundays and holidays.

For nighttime construction and installation work, portable floodlights with a maximum height of approximately 18 feet would be used. All lights on portable lightstands would be downward facing. Any nighttime lighting used during construction and installation would comply with safety and security and local requirements.

Construction equipment, the OnSS, the ICF, and structures within the TNEC ROW would be visible during construction and installation. Although construction is expected to take place primarily during the daylight hours between 7:00 a.m. and 6:00 p.m., some temporary lighting may be required outside those hours. Certain activities associated with cable installation at the chosen landing site (VHB 2023a) could require nighttime activity and lighting to meet rapid construction timelines and to reduce the chances of equipment failure. Nighttime lighting could have a temporary adverse impact on land use and coastal infrastructure by increasing artificial lighting that could be visible by residences and businesses nearby. Therefore, there would be a temporary, **minor** adverse light impact on land use and coastal infrastructure from construction and installation of onshore elements of the Proposed Action.

Noise: Noise and traffic would result from construction and installation of the onshore facilities. As described within the *Onshore Acoustic Assessment* in COP Appendix P2, long-term ambient sound measurements conducted within the proposed layout of the onshore facilities ranged from 44 to 45 dBA (Leq) at night (10:00 p.m. to 7:00 a.m.) and from 49 to 50 dBA during the day (7:00 a.m. to 10:00 p.m.) (VHB 2023b). Operation of construction equipment and construction-related traffic would increase the ambient noise between the typical construction hours of 7:00 a.m. and 6:00 p.m. during the approximately 1-year construction period. The onshore facilities construction noise sources would include equipment used to support the HDD operations at the landfall work area, equipment used to support trenching and cable pulling, and construction vehicles such as excavators, dump trucks, and paving equipment (VHB 2023b).

Temporary construction and facility installation noise would be consistent with noise sources typically associated with a working industrial park. Short-term construction noise impacts would be generated during HDD onshore for the RWEC. A cofferdam could be used to ensure a dry environment during construction and installation and to manage sediment and would align with HDD exit pits. If the cofferdam is required, the cofferdam could be installed as either a sheet piled structure into the seafloor or a gravity cell structure placed on the seafloor using ballast weight. If the cofferdam is installed using sheet pile, a vibratory hammer would be used to drive the sidewalls and endwalls into the seafloor. Installation of the sheet pile cofferdam could take approximately up to 14 days. Noise associated with possible sheet pile installation would produce the maximum amount of noise compared to other construction methods. In general, noise generated by RWEC construction and installation activities would occur during daytime hours (7:00 a.m. to 8:30 p.m.), and would be largely generated by an excavator, crane, and sheet pile driver. If the HDD methodology is selected for construction of the RWEC, HDD operations would occur continuously to minimize the risk of soil settlement and equipment failures and would create noise during nighttime hours (VHB 2023b). Noise generated by construction and installation activities is expected to comply with the Town of North Kingstown noise code. The closest residences to the construction and installation of the onshore transmission cable, ICF, and OnSS are the residences on the south side of Camp Avenue and east side of Mill Creek Drive, which are within a few hundred feet of the construction area. The *Onshore Acoustic Assessment* in COP Appendix P2 (VHB 2023b) analyzes onshore construction noise and found that sound levels around the onshore transmission cable, ICF, and OnSS would be between 40 and 45 dB at residences along the south side of Camp Avenue and east side of Mill Creek Drive, which would be below ambient levels, measured between 44 and 45 dBA (Leq) at night and 49 to 50 dBA during the day at the time of the analysis.

During construction and installation of the onshore elements of the RWEC, construction noise could approach or exceed the Town of North Kingstown’s noise code limit for construction and installation activities at receptors immediately adjacent to the road ROW. EPMs for onshore construction and installation activities include coordination with local governments and compliance with appropriate local ordinances governing noise, light, and traffic impacts consistent with zoned land uses (see Appendix F). These EPMs would minimize, but not eliminate, noise effects on surrounding land uses. However, these effects would be short term and generally consistent with noise impacts associated with general development under zoned land uses. Therefore, there would be short term, **minor** adverse noise impact on land use and coastal infrastructure from construction and installation of onshore elements of the Proposed Action.

3.14.2.3.2 Operations and Maintenance and Decommissioning

Offshore Activities and Facilities

<u>Accidental releases and discharges:</u> The WTGs and OSSs would be designed to contain any potential leakage of fluids, thereby preventing the discharge fluids into the ocean. During WTG operations, small accidental leaks could occur because of broken hoses, pipes, or fasteners. During WTG maintenance, small releases could occur during servicing of hydraulic units or gearboxes. Any accidental leaks within the WTGs would be contained within the hub and main bed frame or tower. During operations, the only

discharges to the sea that are anticipated are those associated with vessels performing maintenance. (see Appendix D of the COP) (VHB 2023a). Decommissioning impacts would be similar to construction and installation impacts discussed above. Any offshore leakage of fluids would not impact land use and coastal infrastructure due to the design feature of WTGs to capture accidental releases and discharges and because implementation of EPMs in Appendix F would minimize the potential for spills. Therefore, there would be a **negligible** adverse impact from accidental releases and discharges on land use and coastal infrastructure from O&M and decommissioning of offshore elements of the Proposed Action.

Light: During operations, offshore structures would require lighting that conforms to FAA and BOEM guidelines, and USCG requirements. BOEM has indicated that offshore lighting should meet standard specifications in FAA Advisory Circulars 70/7460-1L, Change 2 (FAA 2018), and 150/5345-43H (FAA 2016), and USCG standards for marine navigation lighting.

Lighting associated with the Proposed Action would follow lighting and marking design parameters as identified in BOEM’s draft proposed *Guidelines for Providing Information on Lighting and Marking of Structures Supporting Renewable Energy Development*, released April 2021 (BOEM 2021). Control, lighting, marking, and safety systems would be installed on each WTG; the specific systems would vary depending on the turbine selected and would be reviewed as part of the federal approval process.

Offshore turbines must be visible not only to pilots in the air, but also mariners navigating on water. In daylight, offshore wind turbines do not require lighting if the tower and components are painted white. The FAA and USCG consider white-colored turbines to be the most effective early warning technique for both pilots and mariners (Patterson 2005). Marine navigation lighting is regulated by the USCG through 33 CFR 67. Structures must be fitted with lights for nighttime periods. The OSSs would be lit and marked in accordance with FAA and USGS requirements for aviation and navigation obstruction lighting, respectively. Lighting on the RWEC during the O&M phase would be short term and limited to the lighting required on vessels while operating along the corridor. As described above for RWF construction and installation, USCG-approved navigation lighting is required for all vessels operating between dusk and dawn.

Although WTGs and the OSSs would be lit, only a relatively small portion of the onshore locations would have open views of the Project. A viewshed analysis of the Project determined that only 44.9 square miles of land within the 6,113 square mile visual study area could have potential views of the Project from ground level (EDR et al. 2023). The visibility of WTGs and potentially the OSSs would result in a small impact to onshore land uses and coastal infrastructure by increasing light in the offshore environment that could be visible onshore and could slightly increase visible light in coastal communities. Decommissioning impacts would be similar to impacts from Project construction and installation. Therefore, there would be a long-term, **minor** adverse light impact on land use and coastal infrastructure from O&M and decommissioning of offshore elements of the Proposed Action.

Noise: There would be no noise impacts on land use and coastal infrastructure from O&M of offshore facilities. Operational noise would not be audible onshore. Decommissioning impacts would be similar to impacts from Project construction and installation. Therefore, because there would be no effect, the impact on land use and coastal infrastructure from O&M and decommissioning of offshore elements of the Proposed Action would be **negligible** adverse.

Onshore Activities and Facilities

Accidental Releases and Discharges: The OnSS and ICF would require various oils, fuels, and lubricants to support its operations (see COP Table 3.3.1-2 and COP Table 3.3.1-3). Equipment would be mounted on concrete foundations with concrete secondary fluid containment designed for 110% containment and in accordance with industry and local utility standards. With EPMs, accidental release and discharge impacts to land use and coastal infrastructure from onshore O&M would be minimal. Decommissioning would incur similar impacts to those during the construction and installation phase. Therefore, there would be a temporary, **negligible** adverse impact from accidental releases and discharges on land use and coastal infrastructure from O&M and decommissioning of onshore elements of the Proposed Action due to implementation of containment measures and compliance with industry and utility standards.

New cable emplacement/maintenance: Once installed, the onshore components of the RWEC would be located underground, and disturbed areas would be restored to preconstruction conditions or improved. Buried Project features would have no effect on adjacent land uses or coastal infrastructure. Revolution Wind has designed the Project to account for site-specific oceanographic and meteorological conditions within the analysis area, effectively avoiding the potential for beach erosion to expose the RWEC at the sea to shore transition zone.

Due to the temporary and intermittent nature of O&M activities, O&M of onshore facilities would have a **negligible** adverse impact on land use over the 35-year lifespan of the Project.

Impacts during decommissioning would be similar to the impacts during construction and installation. For onshore decommissioning, any removal of the underground, onshore cables (if not decommissioned in place) could result in temporary construction disturbances and delays along the affected roads and near the landing sites. The length and extent of these delays would be shorter in duration compared to those experienced during installation. However, all O&M activities would be consistent with local land use and zoning regulations and would be typical activities associated with industrial and commercial land uses. Therefore, there would be a temporary, **negligible** adverse land disturbance impact on land use and coastal infrastructure from decommissioning of onshore elements of the Proposed Action.

Light: Operational lighting onshore would be limited to the OnSS and ICF. Lighting at these facilities would include 1) yard lighting and 2) task lighting. Both categories would be switched lights and would only be used during yard-based activity. The mounting heights for the lighting would range from 10 to 25 feet off the ground, and the lights would be mounted on lamp posts, substation buildings, fire walls, or steel substation structures. The wattage for the individual lamps would range from 35 to 300 watts depending on the use. Operational lighting for the OnSS and ICF would comply with Quonset Development Corporation lighting regulations and would be mounted with the lamp horizontal to the ground (light facing straight down) or with a lamp tilt no more than 25° from the horizon. The task lighting at both the OnSS and ICF would support emergency maintenance or repairs to the station equipment outside of normal business hours. The task lights would be mounted to direct light toward substation equipment to ensure adequate lighting for workers to perform emergency maintenance or repairs.

Considering the presence of an existing electrical substation and industrial uses of the area, new lighting associated with the OnSS and ICF could adversely affect residences directly adjacent to these facilities. These effects could be reduced through the use of EPMs such as visual screening. Lighting for the OnSS and ICF would be designed to the minimum standard necessary for substation safety and security per utility operational requirements, as well as state and local regulations. General yard lighting would be provided within the OnSS and ICF area for assessment of equipment. In general, yard lighting would be off at night unless lighting is necessary for in-progress site work or for safety and security.

In general, lighting would be minimal and directed downward. Lighting would be removed as part of decommissioning. Therefore, there would be a long-term, **minor** adverse light impact on land use and coastal infrastructure from O&M and decommissioning of onshore elements of the Proposed Action.

Noise: Operational noise of the underground cables is expected have no impacts to current land uses because there would be no permanent noise-generating equipment associated with the onshore transmission cable. The OnSS and ICF, as designed, would generate sound similar to or below existing ambient sound levels; therefore, operational noise levels would have a direct but small impact on land use and coastal infrastructure. The proposed OnSS would introduce new sources of sound including transformers, shun reactors, harmonic filters, and cooling and ventilation associated with the outdoor substation equipment, as well as condensers, pumps, skids, and auxiliary transformers associated with the synchronous condenser building. Sound from the substation would be 43.9 dBA or lower at the closest noise sensitive receptors, which would be below the EPA guideline for noise exposure (48.6 dBA Leq) and below the Town of North Kingston, Rhode Island, nighttime noise ordinance limit for residential properties (50 dBA). Operational sound from the OnSS would also be below 50 dBA at the nearest residential property lines and below 70 dBA at the nearest commercial/industrial property lines, which is below the noise ordinance noise limits (VHB 2023b). O&M vehicles and certain maintenance activities performed during O&M could also periodically generate noise audible to surrounding land uses throughout the life of the Project; generated noise would be similar to typical traffic noise and noise from general construction and installation activities. These continuous and intermittent impacts would be permanent. Noise generated by onshore facilities and O&M activities would be managed under existing local ordinances and regulations as permitted for the approved zoning. Given this, noise impacts on land use from the O&M of onshore facilities would have a **negligible** adverse effect on land use. Decommissioning would generate noise similar to that during the construction and installation phase. Therefore, there would be a long-term **negligible** adverse noise impact on land use and coastal infrastructure from O&M and decommissioning of onshore elements of the Proposed Action.

3.14.2.3.3 Cumulative Impacts

Offshore Activities and Facilities

Accidental releases and discharges: The Proposed Action and other reasonably foreseeable future projects could result in accidental release of contaminants, trash, and debris that could add to releases from other reasonably foreseeable projects. The combined offshore accidental release impacts on land use and coastal infrastructure could increase the risk of and potential impacts from accidental releases in the GAA. The Proposed Action and other reasonably foreseeable projects would be expected to comply with any applicable permit requirements to implement erosion, stormwater, and spill controls to minimize, reduce, or avoid impacts on water and air quality. Land use and coastal infrastructure would be unlikely to be impacted by offshore accidental releases, as accidental releases would be mitigated offshore. As a result, the Proposed Action when combined with past, present, and other reasonably foreseeable projects would result in **negligible** adverse cumulative impacts on land use and coastal infrastructure because there would be no impact on land use and coastal infrastructure.

Light: The Proposed Action would add permanent lighting for up to 102 WTGs and two OSSs. Although this lighting would be visible, in part, from south-facing beaches and coastlines, this represents a small but noticeable (3%) increase over total estimated WTG and OSS foundations providing long-term lighting under the No Action Alternative if all projected offshore wind projects are constructed. BOEM estimates a maximum cumulative total of 3,190 offshore WTGs and OSS foundations for the Proposed Action plus all other future offshore wind projects. The land use impacts from the Proposed Action in the context of reasonably foreseeable future actions would be more extensive than impacts for the Proposed Action alone. However, the Proposed Action and other reasonably foreseeable projects would be expected to comply with applicable permit conditions and lighting requirements to minimize, reduce, or avoid light impacts on onshore land uses and coastal infrastructure. Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be similar to those impacts described under the No Action Alternative and would be **negligible** adverse impacts.

Noise: There would be no noise impacts on land use and coastal infrastructure from offshore facilities. Noise associated with construction and installation, O&M, and decommissioning would not be audible onshore. Similarly, reasonably foreseeable activities are not expected to generate noise levels that would be audible onshore. Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be similar to those impacts described under the No Action Alternative, which are described as having no onshore impacts from offshore facilities and would be **negligible** adverse impacts.

Onshore Activities and Facilities

Accidental releases and discharges: Installation of the RWEC at the landfall location would use an HDD approach to install the cables under the beach and intertidal water areas. Discharge of drilling fluids, solid wastes, and construction debris is possible during construction and installation. Additionally, discharge of oils, fuels, and lubricants is possible at the OnSS and ICF during Project operations and during maintenance activities. The Project would implement EPMs (see Appendix F) and comply with federal, state, and local regulations to reduce the impact to land use and coastal infrastructure. Reasonably foreseeable future projects would also require the construction of onshore facilities at identified ports along the Atlantic coast. Installation of onshore elements of reasonably foreseeable future projects could also result in the discharge of drilling fluids, solid wastes, construction debris, lubricants, oils, fuels, and other hazardous materials during construction, installation, and decommissioning. In context of reasonably foreseeable future actions, the combined offshore accidental release impacts on land use and coastal infrastructure could increase the risk of and potential impacts from accidental releases in the GAA. Other reasonably foreseeable actions would also be required to implement EPMs and adhere to federal, state, and local regulations to ensure that accidental releases and discharges are minimized and mitigated appropriately. Therefore, cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable future activities would be **negligible** adverse on land use and coastal infrastructure.

New cable emplacement/maintenance: The Proposed Action would result in increased onshore land disturbance during the construction and installation phase of the Project. It would result in temporary increases in construction noise, vibration and dust, and intermittent delays in travel along impacted roads. O&M activities would include periodic inspections and repairs at cable access manholes, which would require minimal use of worker vehicles and construction equipment. Reasonably foreseeable projects are expected to also result in land disturbances consistent with the Proposed Action in terms of scale, intensity, and duration at the ports and other facilities across the Atlantic Coast where these projects are expected to occur. Assuming that new substations for future offshore wind projects would be in locations designated for industrial or utility uses, and underground cable conduits would primarily be co-located with roads or other utilities, operation of substations and cable conduits would not affect the established and planned land uses for a local area. Additionally, the Project and other reasonably foreseeable future projects would be required to comply with local land use and zoning regulations, which would reduce impacts to land use and coastal infrastructure. Therefore, cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable future activities would be **minor** adverse on land use and coastal infrastructure.

Light: There would be temporary and permanent light impacts under the Proposed Action. Temporary lighting impacts would occur with Project construction, installation, and decommissioning. While most onshore construction and installation would be completed during daytime hours, some tasks could extend beyond daylight work hours and would require the use of portable floodlights that would face downward. There would also be long-term permanent light impacts associated with O&M. Operational lighting would be limited to the OnSS and ICF. All operational lighting would be required to comply with Quonset Development Corporation lighting regulations. Other reasonably foreseeable projects would also generate onshore lighting impacts similar in nature to the Proposed Action. While many of these lighting impacts would be short term and temporary during Project construction and installation, some lighting associated with onshore facilities would be permanent, resulting in long-term lighting impacts in the vicinity of the OnSS and ICF. Temporary and permanent onshore lighting impacts are expected during construction, installation, O&M, and decommissioning of reasonably foreseeable future projects, including any port upgrades at port facilities described in Appendix E. These impacts are expected to be similar in scale to the lighting impacts for the Proposed Action but distributed across port facilities along the Atlantic coast. Temporary and permanent lighting would require compliance with local development regulations at the port facilities and locations where reasonably foreseeable future projects would experience onshore lighting impacts. Therefore, cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable future activities would be **minor** adverse on land use and coastal infrastructure.

Noise: There would be noise impacts associated with the construction and installation of the Proposed Action. Construction and installation would be limited to daylight hours and noise impacts would consist of noise generated from heavy equipment used for clearing, grading, excavation, foundation installation, and heavy lifting of substation components. Noise modeling conducted for operations of the OnSS (VHB 2023b) indicates that predicted noise levels would be below the minimum disturbance thresholds specified by code (Article VI, Sec. 8-87[a]) (Town of North Kingstown, Rhode Island 2021b). No permanent noise-generating equipment would be associated with the onshore transmission cable, resulting in no impacts to current land uses from operational noise. The OnSS and ICF, as designed, would generate sound similar to or below existing ambient sound levels, as described in Section 3.14.2.2.2;

therefore, operational noise levels would have a direct but small impact on land use and coastal infrastructure by increasing noise levels in the vicinity of onshore elements of the Proposed Action. Additionally, O&M and maintenance vehicles could result in increased noise in the vicinity when maintenance is being performed. However, all equipment and O&M activities would be designed for and consistent with zoned land uses and appropriate ordinance restrictions, as described in Section 3.14.2.2.2. It is expected that noise impacts generated by other planned and foreseeable future actions would be generally similar to those generated under the Proposed Action, and those actions would similarly manage impacts consistent with local ordinances applicable to zoned land uses. Therefore, cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable future activities would have a **negligible** adverse effect on land use and coastal infrastructure.

3.14.2.3.4 Conclusions

Proposed Action construction, installation, and decommissioning would temporarily generate noise, vibration, and vehicular traffic. Impacts during O&M would be expected to be similar, but in lower duration and extent. Therefore, BOEM expects the overall impact on land use and coastal infrastructure from the Proposed Action alone to be **minor** adverse. Proposed Action O&M would also generate long-term, **minor** beneficial impacts by supporting designated uses at ports and potentially promoting port improvements and/or redevelopment, though no port improvements are currently proposed as part of the Project.

Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **minor** adverse impacts to land use and coastal infrastructure. BOEM made this call because, although port use during construction and installation could result in moderate adverse impacts, the overall effect when impacts are considered over the entire GAA and analysis duration would be small and the resource would be expected to recover completely.

3.14.2.4 Alternatives C, D, E, and F

Table 3.14-1 provides a summary of IPF findings for these alternatives.

3.14.2.4.1 Conclusions

Although Alternatives C through F would reduce the number of WTGs and possibly reduce the miles of IAC, these changes would not measurably affect land use and coastal infrastructure. Therefore, BOEM expects that the impacts to land use and coastal infrastructure resulting from the alternative would be similar to the Proposed Action and would result in **minor** adverse and **minor** beneficial impacts, which is the same impact determination as the Proposed Action.

The overall impacts of Alternatives C through F when combined with past, present, and reasonably foreseeable activities would therefore be the same as the Proposed Action: **minor** adverse.

3.14.2.5 Alternative G: Impacts of the Preferred Alternative on Land Use and Coastal Infrastructure

Table 3.14-1 provides a summary of IPF findings for this alternative.

3.14.2.5.1 Conclusions

Although Alternative G would reduce the number of WTGs and the miles of IAC, these changes would not measurably affect land use and coastal infrastructure. Therefore, BOEM expects that the impacts to land use and coastal infrastructure resulting from Alternative G would be similar to the Proposed Action and would result in **minor** adverse and **minor** beneficial impacts, which is the same impact determination as the Proposed Action.

3.14.2.6 Mitigation

No potential additional mitigation measures for land use and coastal infrastructure are identified in Table F-2 or F-3 in Appendix F.

3.15 Marine Mammals (see section in main EIS)

3.16 Navigation and Vessel Traffic (see section in main EIS)

3.17 Other Marine Uses (see section in main EIS for Scientific Research and Surveys)

3.17.1 Description of the Affected Environment for Other Marine Uses

Geographic analysis area: The GAAs for Other Marine Uses are as follows (Figure 3.17-1):

Aviation and air traffic: Airspace and airports used by regional air traffic.

Land-based radar: Includes air space used by regional traffic.

Marine mineral resources and dredged material disposal: Areas within 0.25 mile of the Project and footprints of other cables and wind lease areas in the RI/MA WEA.

Military and national security: An area roughly bounded by Montauk, New York; Providence, Rhode Island; Provincetown, Massachusetts; and within a 10-mile buffer from wind lease areas in the RI/MA WEA.

Offshore energy uses: Other known wind energy project locations.

Undersea cables: Area within 1 mile of the Project and other undersea facilities and wind lease areas in the RI/MA WEA.

These areas encompass locations where BOEM anticipates direct and indirect impacts associated with Project construction and installation, O&M, and decommissioning. The scientific research survey area encompasses the locations where scientific research and surveys are anticipated to occur.

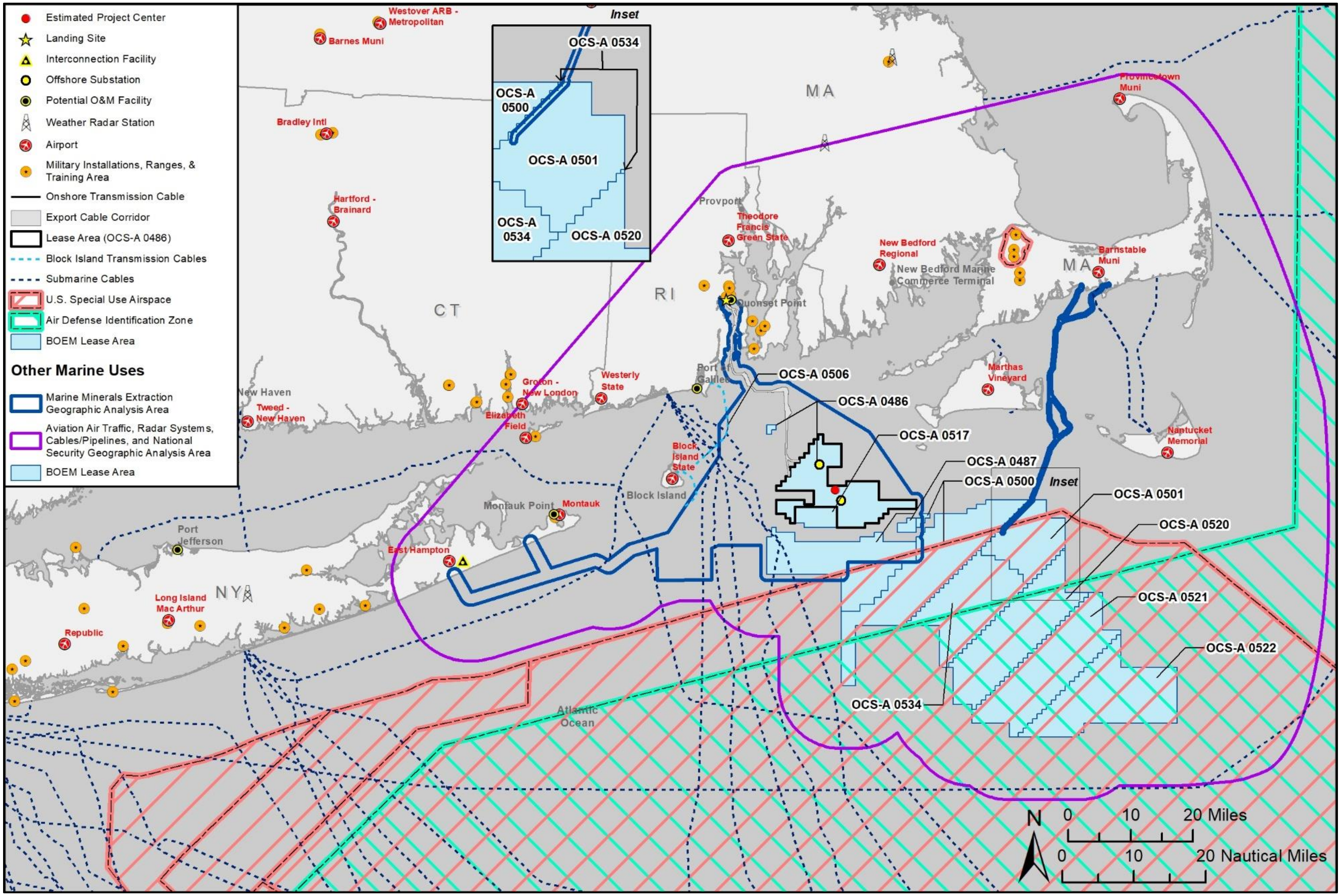

Figure 3.17-1. Geographic analysis areas for other marine uses.

3.17.1.1 Aviation and Air Traffic

Affected environment: Numerous public and private airports serve portions of New York, Rhode Island, and Massachusetts in the GAA. Major airports serving the region include Boston Logan International Airport, located approximately 100 miles northeast of the Project; T.F. Green Airport in Providence, Rhode Island, located approximately 50 miles north of the Project; and Montauk Airport in Montauk, New York, approximately 30 miles west of the RWF and 9 miles north of the offshore RWEC. The closest public airports to the Project are Nantucket Memorial Airport, approximately 55 miles east on Nantucket; Martha's Vineyard Airport, approximately 32 miles northeast on Martha's Vineyard; and Block Island State Airport, approximately 20 miles west on Block Island.

3.17.1.2 Land-Based Radar

Affected environment: Several radar systems supporting commercial air traffic control, national defense, weather forecasting, and ocean condition observation operate near the Project (Westslope Consulting, LLC [Westslope] 2021). Six high-frequency (HF) airport surveillance radar (ASR) sites are located near the Project: Boston ASR-9, Falmouth ASR-8, Nantucket ASR-9, North Truro ARSR-4, Providence ASR-9, and Riverhead ARSR-4. The study area is beyond the instrumented range of the Boston ASR-9.

Three navigational aid sites are near the Project: Martha's Vineyard VOR/DME, the Providence VOR/DME, and Sandy Point VOR/DME. Two NEXRAD weather radar systems, the Boston WSR-88D and Brookhaven WSR-88D, are located near the Project.

There are 13 HF radar sites located near the Project:

- Amagansett HF radar (operated by Rutgers University)
- Block Island Long Range HF radar (two radars operated by the University of Rhode Island and Rutgers University)
- Camp Varnum HF radar (operated by Woods Hole Oceanographic Institution)
- Horseneck Beach State Reservation HF radar (operated by Woods Hole Oceanographic Institution)
- Long Point Wildlife Refuge HF radar (operated by Woods Hole Oceanographic Institution)
- Martha's Vineyard HF radar
- Moriches HF radar (operated by Woods Hole Oceanographic Institution)
- Martha's Vineyard Coastal Observatory (MVCO) Meteorological Mast HF radar (operated by Woods Hole Oceanographic Institution)
- Nantucket Island HF radar (two radars operated by Rutgers University and Woods Hole Oceanographic Institution).
- Nauset HF radar (operated by the University of Massachusetts Dartmouth)
- Squibnocket Farms HF radar (operated by Woods Hole Oceanographic Institution)

3.17.1.3 Military and National Security

<u>Affected environment:</u> The U.S. Navy, the USCG, and other military entities have numerous facilities in the region. Major onshore regional facilities include Naval Station Newport, the Naval Submarine Base New London, the Northeast Range Complex/Narragansett Bay Operation Area, Joint Base Cape Cod, and numerous USCG stations (Epsilon Associates, Inc. 2018). Onshore and offshore military use areas could have designated surface and subsurface boundaries and special use airspace. The Project is entirely within the Navy's Narragansett Operating Area in which national defense training exercises and system qualification tests are routinely conducted (MARCO 2021). This operating area extends approximately 100 miles south and 200 miles east of the Project. The Project is approximately 10 miles north of a Military Special Use Airspace (FK Facility Narragansett Bay) and 20 miles northeast of the closest submarine transit lanes. A DOD assessment of compatibility of offshore wind development with military assets and activities determined that potential conflicts exist in the area surrounding the Project and could require site-specific mitigation measures (OCM 2019).

3.17.1.4 NOAA's Scientific Research and Surveys (see section in main EIS)

3.17.1.5 Undersea Cables

<u>Affected environment:</u> There are existing submarine cables that run through the regional waters. Most pass through Green Hill, Rhode Island. In addition, there are NOAA nautical chart cable and pipeline areas that denote where such infrastructure may be located. The existence of these areas does not necessarily mean that actual cables or pipeline are present (BOEM 2013). Other than cables for other offshore wind projects, BOEM has not identified any publicly noticed plans for additional submarine cables or pipelines; therefore, no new cable installation is reasonably foreseeable for the purposes of this EIS.

3.17.2 Environmental Consequences

3.17.2.1 Relevant Design Parameters, Impact-Producing Factors, and Potential Variances in Impacts

The analysis presented in this section considers the impacts resulting from the maximum design scenario under the project design envelope (PDE) approach developed by BOEM to support offshore wind project development (Rowe et al. 2017). The maximum design size specifications defined in Appendix D, Table D-1, are PDE parameters used to conduct this analysis.

The following design parameters would result in different impacts relative to those generated by the design elements considered under the PDE:

- The selection of lower capacity WTG designs would reduce the total WTG height from 873 to as low as 648 feet, reducing impacts to aviation and air traffic, land-based radar, and military and national security.

See Appendix E1 for a summary of IPFs analyzed for other marine uses across all action alternatives. IPFs that are either not applicable to the resource or determined by BOEM to have a negligible adverse effect are excluded from Chapter 3 and provided in Appendix E1, Tables E2-15 to E2-21. Other marine uses subsections (NOAA's scientific research and surveys) are discussed in the main EIS.

Table 3.17-1 provides a summary of IPF findings carried forward for analysis in this section. Each alternative analysis discussion consists of the construction and installation phase, the O&M phase, the decommissioning phase, and the cumulative analysis. If these analyses are not substantially different, then they are presented as one discussion. This comparison considers the implementation of all EPMs proposed by Revolution Wind to avoid and minimize adverse impacts on other marine uses. These EPMs are summarized in Appendix F, Table F-1.

A detailed analysis of the Proposed Action is provided following the table. Detailed analysis of other considered action alternatives is also provided below the table if analysis indicates that the alternative(s) would result in substantially different impacts than the Proposed Action. Offshore and onshore IPFs are addressed separately in the analysis if appropriate for the resource; not all IPFs have both an offshore and onshore component. Where feasible, calculations for specific alternative impacts are provided in Appendix E4, to facilitate reader comparison across alternatives.

The Conclusion section within each alternative analysis discussion includes rationale for the effects determinations. The overall effect determination for each alternative is **minor** adverse impacts for aviation and air traffic; **moderate** adverse for land-based radar; **moderate** adverse for military uses; and **negligible** adverse for undersea cables.

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Table 3.17-1. Alternative Comparison Summary for Other Marine Uses

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
Aviation and Air Traffic							
Aviation and air traffic	**Offshore:** Future offshore wind activities without the Proposed Action could result in increased air traffic due to the use of helicopters and other aircraft during construction and installation, O&M, and decommissioning of future wind projects. With implementation of FAA-approved flight plans, however, impacts of the No Action Alternative on aviation and air traffic would be **negligible** adverse.	**Offshore:** The Proposed Action would result in an increase in air traffic related to construction and installation of offshore Project elements. A helicopter route plan would be developed to meet industry guidelines and best practices in accordance with FAA guidance. Additionally, all aviation operations, including flying routes and altitude, would be aligned with relevant stakeholders, such as the FAA. On this basis, the effects of Project-related aviation and air traffic on aviation and air traffic under the Proposed Action would be **minor** adverse. Helicopter flights for Project O&M would represent a 0.1% increase in annual helicopter flight hours and a 0.01% increase in general aviation hours in the GAA. When estimation uncertainty is considered, this represents a **negligible** adverse effect on general aviation air traffic. The Proposed Action and reasonably foreseeable future wind projects would be required to engage the FAA in flight planning to avoid impacts to civilian, commercial, government, and military aviation operations. Therefore, the Proposed Action when combined with past, present, and other reasonably foreseeable project impacts would result in **negligible** adverse impacts on aviation and air traffic.	**Offshore:** This alternative could require fewer construction and O&M–related helicopter trips due to the reduction in the number of offshore elements, incrementally reducing the number of construction-related helicopter trips. While Alternatives C to F could result in slightly reduced air traffic, the effects of this IPF on aviation and air traffic under each alternative would otherwise be similar to those described for the Proposed Action: **minor** adverse for construction and **negligible** adverse for O&M and cumulative impacts.				**Offshore:** Alternative G could require fewer construction and O&M–related helicopter trips due to the reduction in the number of offshore elements and shorter IAC. Although this alternative could result in slightly reduced air traffic, the effects of this IPF on aviation and air traffic would otherwise be similar to the Proposed Action: **minor** adverse for construction and **negligible** adverse for O&M and cumulative impacts.
Light	**Offshore:** Future offshore wind activities without the Proposed Action would result in an increase in permanent aviation warning lighting on WTGs offshore. The addition of up to 1,015 lighted structures represents a small increase in the combined vessel, navigation, housing, and port lights within the GAA; therefore, the effects of light on aviation and air traffic under the No Action Alternative would be **minor** adverse.	**Offshore:** During construction and installation and O&M, WTGs would be marked with appropriate lighting to meet FAA warning guidelines and would be visible on the radar systems of low-flying aircraft, similar to other large-scale sea surface activity. Therefore, impacts to aviation and air traffic would be **negligible** adverse. BOEM estimates a maximum cumulative total of up to 1,117 offshore WTGs and OSS foundations for the Proposed Action plus all other future offshore wind projects in the RI/MA WEA. All existing stationary structures would have navigation marking and lighting in accordance with FAA, USCG, and BOEM guidelines to minimize collision and allision risks. WTGs would also be visible on aircraft radar. Therefore, the cumulative impacts associated with the Proposed Action when combined with past,	**Offshore:** Under Alternatives C through F, fewer lighted WTG locations would be approved by BOEM when compared to the maximum-case scenario under the Proposed Action. However, this slight reduction in lighting would not be expected to measurably reduce aviation and air traffic impacts compared to those impacts described under the Proposed Action. Therefore, the impact on aviation and air traffic under each alternative would be **negligible** adverse for all Project phases.				**Offshore:** Under Alternative G, fewer lighted WTG locations would be approved by BOEM when compared to the maximum-case scenario under the Proposed Action. However, this slight reduction in lighting would not be expected to measurably reduce aviation and air traffic impacts compared to the Proposed Action. Therefore, the impact on aviation and air traffic would be **negligible** adverse for all Project phases.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
		present, and reasonably foreseeable activities would have a **negligible** adverse impact on aviation and air traffic.					
	Onshore: See offshore analysis.	**Onshore:** Operational lighting onshore would be limited to the OnSS and ICF, which would have minimal yard lighting and task lighting. This lighting is minimal and would not result in impacts to aviation and air traffic. Decommissioning would have impacts similar to those during Project construction. Therefore, the effects of light on aviation and air traffic under the Proposed Action would be **negligible** adverse.	**Onshore:** Alternatives C through F would consist of the same onshore facilities and activities as those planned under the Proposed Action. Therefore, onshore impacts to aviation and air traffic from Project activities would be **negligible** adverse.				**Onshore**: Alternative G would consist of the same onshore facilities and activities as the Proposed Action. Therefore, onshore impacts to aviation and air traffic from Project activities would be **negligible** adverse.
Port utilization	**Offshore:** Port improvements and construction activities in or near ports may also require alteration of navigation patterns at nearby airports. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Therefore, port utilization is expected to have a **negligible** adverse effect on aviation and air traffic.	**Offshore:** Port improvements and construction activities in or near ports may require alteration of navigation patterns at nearby airports. However, vessel traffic would also be spread among multiple ports to ensure that sufficient capacity exists at each port and in each waterway. Therefore, port utilization is expected to have a **negligible** adverse effect on aviation and air traffic.	**Offshore:** Alternatives C through F would require a shorter construction duration, a smaller construction footprint, and fewer offshore structures. While Alternatives C through F could result in a slight reduction in port utilization, the effects of this IPF on aviation and air traffic under Alternatives C through F would otherwise be similar to those described for the Proposed Action and would therefore be **negligible** adverse for all Project phases**.**				**Offshore:** Alternative G would require a shorter construction duration, a smaller construction footprint, and fewer offshore structures. Although Alternative G could result in a slight reduction in port utilization for all Project phases, the effects of this IPF on aviation and air traffic would otherwise be similar to the Proposed Action and would therefore be **negligible** adverse.
	Onshore: See offshore analysis.	**Onshore:** Ports would be primarily used during construction and installation of the Proposed Action, as ports would be used for staging WTGs and mobilizing construction work. Decommissioning would have impacts similar to those during Project construction. There would be no impacts to aviation and air traffic from O&M and decommissioning of the Proposed Action; therefore, impacts would be **negligible** adverse. Cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **minor** adverse on aviation and air traffic.	**Onshore:** Alternatives C through F would consist of the same onshore facilities and activities as those planned under the Proposed Action. Therefore, onshore impacts to aviation and air traffic from Project activities would be **negligible** to **minor** adverse.				**Onshore:** Alternative G would consist of the same onshore facilities and activities as the Proposed Action. Therefore, onshore impacts to aviation and air traffic from Project activities would be **negligible** to **minor** adverse.
Presence of structures	**Offshore:** Future offshore wind development could add up to 1,015 structures to the offshore environment in the GAA. BOEM assumes that offshore wind project operators would coordinate with aviation interests throughout the planning, construction and installation, O&M, and decommissioning process to avoid or	**Offshore:** The Proposed Action would add up to 100 WTGs with maximum blade tip heights of up to 853 feet amsl. The addition of these structures would increase navigational complexity and could change aircraft navigation patterns for aircraft flying at low altitudes and for airports in the vicinity, increasing collision risks for some aircraft during the Proposed Action's operational time frame. However, more than 90% of existing air traffic in the GAA would	**Offshore:** Under Alternatives C through F, fewer WTG locations would be approved by BOEM, which would result in a noticeably smaller offshore impact compared to the maximum-case scenario under the Proposed Action. The effects of this IPF would be the same or slightly reduced to those described for the Proposed Action and would therefore be **negligible** adverse for construction and O&M, and **minor** adverse for cumulative impacts.				**Offshore:** Under Alternative G, fewer WTG locations would be approved by BOEM, which would result in a noticeably smaller offshore impact compared to the maximum-case scenario under the Proposed Action. The effects of this IPF would be the same or slightly reduced to those described for the Proposed Action and would therefore be **negligible**

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
	minimize impacts on aviation activities and air traffic. For this reason, the effects of the increased presence of structures to aviation and air traffic under the No Action Alternative are anticipated to be **minor** adverse.	occur at altitudes that would not be impacted by the presence of WTGs (BOEM 2021). Therefore, the effects of the presence of structures on aviation and air traffic under the Proposed Action would be **negligible** adverse. BOEM estimates a cumulative total of up to 1,117 offshore WTGs and OSS foundations for the Proposed Action plus all other future offshore wind projects in the RI/MA WEA. Therefore, the Proposed Action when combined with past, present, and other reasonably foreseeable Project impacts would result in a **minor** adverse impact on aviation and air traffic.					adverse for construction and O&M, and **minor** adverse for cumulative impacts.
	Onshore: See offshore analysis.	**Onshore:** The O&M of onshore structures to support the Proposed Action would not impact aviation and air traffic. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Onshore:** Alternatives C through F would consist of the same onshore facilities and activities as those planned under the Proposed Action. Therefore, onshore impacts to aviation and air traffic from Project activities would be **negligible** adverse.				**Onshore**: Alternative G would consist of the same onshore facilities and activities as the Proposed Action. Therefore, onshore impacts to aviation and air traffic from Project activities would be **negligible** adverse.
Vessel traffic	**Offshore:** Vessel traffic is expected to have a **negligible** adverse effect on aviation and air traffic because vessel traffic would be spread throughout a large geographic area, and while construction time frames may overlap, it is anticipated that the slight increase in vessel traffic would not impact aviation and air traffic.	**Offshore:** Vessel traffic associated with the Proposed Action would result in increased vessel traffic in the Lease Area and around ports. Construction of offshore structures would incrementally noticeably increase navigational complexity along transit routes between ports and construction sites, and locally around ports, due to increased vessel traffic. Increased vessel traffic is expected to have a **negligible** adverse effect on aviation and air traffic because vessel traffic would be spread throughout a large geographic area and would occur over a short period of time. Vessel traffic associated with the Proposed Action and reasonably foreseeable future actions would result in increased vessel traffic in the GAA. Therefore, the Proposed Action when combined with past, present, and other reasonably foreseeable project impacts would result in a **minor** adverse impact on aviation and air traffic.	**Offshore:** Under Alternatives C through F, fewer WTG locations would be approved by BOEM. Construction and installation vessel traffic may result in slightly reduced vessel traffic in the Lease Area and around ports given the smaller offshore footprint. Reduced navigational complexity combined with a smaller construction footprint and fewer offshore structures would result in the effects of this IPF being the same or slightly reduced relative to those described for the Proposed Action. Therefore, impacts would be **negligible** adverse for construction and O&M and **minor** adverse for cumulative impacts.				**Offshore**: Under Alternative G, fewer WTG locations would be approved by BOEM. Construction and installation vessel traffic may result in slightly reduced vessel traffic in the Lease Area and around ports given the smaller offshore footprint. Reduced navigational complexity combined with a smaller construction footprint and fewer offshore structures would result in the effects of this IPF being the same or slightly reduced relative to the Proposed Action. Therefore, impacts would be **negligible** adverse for construction and O&M and **minor** adverse for cumulative impacts.
	Onshore: See offshore analysis.	**Onshore:** Onshore vehicle traffic may increase as a result of O&M and decommissioning of the Proposed Action but would not impact aviation and air traffic because aviation and air traffic uses are generally spatially separate from vehicular traffic and occur in different locations. Therefore, this IPF would result in a **negligible** adverse impact because minimal increases in vehicle traffic would not impact aviation and air traffic.	**Onshore:** Alternatives C through F would consist of the same onshore facilities and activities as those planned under the Proposed Action. Therefore, onshore impacts to aviation and air traffic from Project activities would be **negligible** adverse.				**Onshore:** Alternative G would consist of the same onshore facilities and activities as the Proposed Action. Therefore, onshore impacts to aviation and air traffic from Project activities would be **negligible** adverse.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
Military and National Security (including search and rescue)							
Anchoring and new cable emplacement/ maintenance	**Offshore:** Offshore energy facility construction of new cable emplacement and maintenance of cables would involve increased vessel traffic, which could impact military and national security uses by increasing the number of vessels within the GAA. Increased vessel traffic due to anchoring and cable maintenance of wind facilities could lead to course changes of military vessels, thereby increasing navigational complexity and risk of collisions. However, these impacts are expected to be limited as cable emplacement vessels would be restricted to emplacement corridors and activities would be of short duration for future offshore wind activities. Therefore, the effects of anchoring and new cable emplacement and maintenance under the No Action Alternative on military and national security would be **negligible** adverse.	**Offshore:** Anchoring and mooring activities would involve increased vessel traffic, which could impact military and national security uses by increasing the number of vessels within the GAA. However, the impacts are expected to be limited as cable emplacement vessels would be restricted to emplacement corridors and activities would be of short duration during construction and installation of offshore Project elements. Therefore, the effects of anchoring and new cable emplacement and maintenance under the Proposed Action on military and national security would be **negligible** adverse. Project activities combined with reasonably foreseeable activities would result in a substantive and appreciable increase in vessel traffic during cable emplacement and maintenance, contributing to a **minor** adverse impact on military and national security.	**Offshore:** Because the impact would be slightly reduced regardless of the configuration selected, all offshore impacts under Alternatives C through F would be slightly reduced compared to the Proposed Action. The effects of this IPF would therefore be **negligible** to **minor** adverse.				**Offshore:** Although the offshore footprint would be reduced, the effects of this IPF on military and national security uses under Alternative G would otherwise be similar to the Proposed Action. The effects of this IPF would therefore be **negligible** to **minor** adverse.
Aviation and air traffic	**Offshore:** Future offshore wind activities could result in increased air traffic due to the use of helicopters and other aircraft during construction and installation, O&M, and decommissioning of future wind projects. With implementation of FAA-approved flight plans, however, impacts of the No Action Alternative on military and national security would be **negligible** adverse.	**Offshore:** Construction and installation of the Proposed Action would result in a 7% increase in general aviation in the GAA. Therefore, the effects of this IPF on military and national security under the Proposed Action would be **minor** adverse. O&M of the Proposed Action would result in a 0.01% increase in general aviation in the GAA. Therefore, the effects of this IPF on military and national security would be **negligible** adverse. The Proposed Action and reasonably foreseeable future wind projects would be required to engage the FAA in flight planning to avoid impacts to civilian, commercial, government, and military aviation operations. Therefore, the Proposed Action when combined with past, present, and other reasonably foreseeable project impacts would result in **minor** adverse impacts on military and national security.	**Offshore:** Alternatives C through F would require fewer construction and O&M–related helicopter trips due to the reduction in the number of offshore elements. However, the effects of this IPF on military and national security would otherwise be similar to those described for the Proposed Action: **negligible** adverse for O&M and **minor** adverse for construction and cumulative impacts.				**Offshore:** Alternative G would require fewer construction and O&M–related helicopter trips due to the reduction in the number of offshore elements. However, the effects of this IPF on military and national security would otherwise be similar to the Proposed Action: **negligible** adverse for O&M and **minor** adverse for construction and cumulative impacts.
Light	**Offshore:** Future offshore wind activities would result in an increase in permanent	**Offshore:** The Proposed Action would result in an increase in temporary construction aviation warning	**Offshore:** Under these alternatives, fewer lighted WTG locations would be approved by BOEM. While Alternatives C through F could result in a reduction in construction lighting,				**Offshore**: Under this alternative, fewer lighted WTG locations would be approved by BOEM.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
	aviation warning lighting on WTGs offshore, which would add to vessel and navigational lighting, as well as onshore housing and port lighting, in the GAA, which could have a negative impact on military and national security. Therefore, the effects of light on military and national security under the No Action Alternative would be **minor** adverse.	lighting on WTGs offshore, which could have **minor** adverse impacts. The O&M and decommissioning of the Proposed Action would result in an increase in permanent lighting on WTGs offshore until decommissioning is complete. The addition of permanent lighting would be an ongoing impact; therefore, the effects of light on military and national security under the Proposed Action would be **minor** adverse. The Project, with reasonably foreseeable future actions, could result in the addition of up to 1,127 lighted structures in the GAA. Therefore, the cumulative impacts of light on military and national security would be **minor** adverse.	the effects of this IPF on military and national security uses would otherwise be similar to those described for the Proposed Action. Therefore, the impact on military and national security uses would be **minor** adverse.				Although Alternative G could result in a reduction in construction lighting, the effects of this IPF on military and national security uses would otherwise be similar to the Proposed Action. Therefore, the impact on military and national security uses would be **minor** adverse.
Presence of structures	**Offshore:** Installation of up to 1,036 structures in the RI/MA WEA would impact military and national security vessels primarily through risk of allision and collision with stationary structures and other vessels. Based on coordinating efforts and anticipated mitigating measures, however, the overall impacts to military and national security uses are anticipated to be **moderate** adverse.	**Offshore:** Construction of the Proposed Action would increase the risk of collisions and allisions for military and national security vessels or aircraft within the WEA. Structures would be marked as a navigational hazard per FAA, BOEM, and USCG requirements, and risk would be consistent within the 35-year operational period. The Project's 1 × 1–nm spacing reduces some of the risk of collisions and allisions. Therefore, the Project would have **minor** to **moderate** adverse impacts on military operations and national security. The presence of additional recreational vessels would add to conflict or collision risks for military and national security vessels and could increase demand for SAR operations. Therefore, the Project would have **minor** adverse O&M impacts on military operations and national security. The Proposed Action structures represent a 10% increase over total estimated WTG and OSS foundations across the GAA under the No Action Alternative. Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would consist predominately of impacts described under the No Action Alternative, which would be **moderate** adverse.	**Offshore:** While the offshore footprint would be reduced under all configurations, the effects of this IPF on military and national security uses under Alternatives C through F would otherwise be similar to those described for the Proposed Action. Therefore, the impact of this IPF on military and national security uses would be **minor** to **moderate** adverse.				**Offshore:** Although the offshore footprint would be reduced, the effects of this IPF on military and national security uses under Alternative G would otherwise be similar to those described for the Proposed Action. Therefore, the impact of this IPF on military and national security uses would be **minor** to **moderate** adverse.
Vessel traffic	**Offshore:** Increased vessel traffic due to construction and decommissioning of future offshore wind facilities could lead to course changes of military and national security vessels, congestion and	**Offshore:** Increased vessel traffic could impact military and national security uses by increasing the number of vessels in the GAA. The RWF's proposed 1 × 1–nm spacing would result in more space for vessels to navigate and would help reduce conflicts	**Offshore:** Vessel traffic associated with Alternatives C through F may result in slightly reduced vessel traffic in the Lease Area and around ports given the smaller offshore footprint. While the offshore footprint would be reduced under all configurations, vessel traffic is expected to remain at similar levels as vessel traffic under the Project. Reduced navigational complexity combined with a smaller construction footprint and fewer offshore				**Offshore:** Vessel traffic associated with Alternative G may result in slightly reduced vessel traffic in the Lease Area and around ports given the smaller offshore footprint. Reduced navigational complexity combined

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
	delays at ports, and increased traffic along vessel transit routes. Therefore, the effects of vessel traffic on military and national security under the No Action Alternative would be **minor** adverse.	with military vessels. As a result, the effects of vessel traffic on military and national security uses under the Proposed Action would be **minor** adverse. The Proposed Action represents approximately 2% of typical vessel traffic in the GAA. Therefore, the Proposed Action would result in a **minor** adverse impact for vessel traffic on military and national security.	structures would result in the effects of this IPF being the same or slightly reduced relative to those described for the Proposed Action. Therefore, impacts on military and national security would be **minor** adverse.				with a smaller construction footprint and fewer offshore structures would result in the effects of this IPF being the same or slightly reduced relative to the Proposed Action. Therefore, impacts on military and national security would be **minor** adverse.
Land-Based Radar							
Presence of structures	**Offshore:** Construction of 1,015 structures in the RI/MA WEA could lead to long-term, **minor** adverse impacts to radar systems. However, these structures would be sited at such a distance from existing and proposed land-based radar systems to minimize interference to most radar systems. The final Massachusetts and Rhode Island port access route study (USCG 2020) concludes that general mitigation measures, such as properly trained radar operators, properly installed and adjusted vessel equipment, marked wind turbines, and the use of AIS all enable safe navigation with minimal loss of radar detection.	**Offshore:** Construction and installation and O&M of offshore Project components could result in impacts to land-based radar by introducing potential obstacles to radar coverage in the RI/MA WEA. The final Massachusetts and Rhode Island port access route study (USCG 2020) concludes that general mitigation measures, such as properly trained radar operators, properly installed and adjusted vessel equipment, marked wind turbines, and the use of AIS all enable safe navigation with minimal loss of radar detection. Therefore, the offshore Project components would result in **negligible** adverse impacts to land-based radar. The Proposed Action and past, present, and reasonably foreseeable activities would result in **minor** adverse impacts to land-based radar.	**Offshore:** Under Alternatives C through F, fewer WTG locations would be approved by BOEM. Because the impact would be slightly reduced regardless of configuration selected, all offshore impacts would be slightly reduced compared to the Proposed Action and would therefore be **negligible** to **minor** adverse. Radar line of sight backscatter effects may be altered or slightly reduced depending on which alternative configuration is selected, as all alternative configurations would reduce the number of WTGs. This could result in slightly reduced impacts to land-based radar at Falmouth ASR-8, Nantucket ASR-9, and the Providence ASR-9.				**Offshore:** Under Alternative G, fewer WTG locations would be approved by BOEM. Because all offshore impacts would be slightly reduced compared to the Proposed Action, alternative impacts would therefore be **negligible** to **minor** adverse. Radar line-of-sight backscatter effects may be altered or slightly reduced because this alternative would reduce the number of WTGs. This could result in slightly reduced impacts to land-based radar at Falmouth ASR-8, Nantucket ASR-9, and the Providence ASR-9.
Vessel traffic	**Offshore:** Construction and operational vessel traffic from future offshore wind development is expected to increase. This could impact land-based radar by increasing the number of vessels in the analysis area. BOEM assumes that all offshore wind developments in the GAA would use the developer agreed upon 1 × 1–nm spacing that aligns with other proposed adjacent offshore wind projects in the RI/MA WEA. This would allow more space for vessels to navigate and would help reduce potential interference on radar systems. As a result, the effects of vessel traffic on land-based radar under the No Action Alternative would be **minor** adverse.	**Offshore:** There would be increased construction and operational vessel and O&M traffic from the Proposed Action. This could impact land-based radar by increasing the number of vessels in the analysis area. The RWF's proposed 1 × 1–nm spacing would provide more space for vessels to navigate and would help reduce potential interference on radar systems. As a result, the effects of vessel traffic on land-based radar under the Proposed Action would be **negligible** adverse. Reasonably foreseeable activities are expected to also generate vessel traffic that would increase the number of vessels in the RI/MA WEA. EPMs would reduce the cumulative impacts of increased vessel traffic to a **minor** adverse level.	**Offshore:** Vessel traffic associated with Alternatives C through F may result in slightly reduced vessel traffic in the Lease Area and around ports given the smaller offshore footprint Reduced navigational complexity combined with a smaller construction footprint and fewer offshore structures would result in the effects of this IPF being the same or slightly reduced relative to those described for the Proposed Action. Therefore, impacts on land-based radar would be **negligible** adverse for construction and O&M and **minor** adverse for cumulative impacts.				**Offshore:** Vessel traffic associated with Alternative G may result in slightly reduced vessel traffic in the Lease Area and around ports given the smaller offshore footprint. Reduced navigational complexity combined with a smaller construction footprint and fewer offshore structures would result in the effects of this IPF being the same or slightly reduced relative to those described for the Proposed Action. Therefore, impacts on land-based radar would be **negligible** adverse for construction and O&M and **minor** adverse for cumulative impacts.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
Undersea Cables							
Presence of structures	**Offshore:** The future development of multiple wind energy projects could increase the complexity of undersea cable development by requiring routing around the facilities. Export cables are unlikely to preclude future undersea cable development because cable crossings can be protected using standard design techniques. Therefore, in the context of reasonably foreseeable environmental trends, the overall impacts from the presence of structures resulting from ongoing and planned actions are anticipated to be localized long term **negligible** because impacts can be avoided by routing design and standard cable protection techniques.	**Offshore:** The presence of the Project could preclude future submarine cable placement in the RWF and RWEC, although there are no future cables identified for location within this area. The impacts from foundation construction would be minor adverse while the installation of the RWECs would be **negligible** adverse. Once the foundations are constructed, impacts from foundation O&M and decommissioning would be **minor** adverse and O&M and decommissioning of RWECs would be **negligible** adverse. The overall impact from presence of structures on undersea cables would be **minor** adverse. BOEM estimates a cumulative total of up to 1,117 offshore WTGs and OSS foundations for the Proposed Action plus all other future offshore wind projects in the RI/MA WEA. While these structures could increase the routing complexity of undersea cables associated, cable crossing can be protected using standard cable protections. The impacts from foundation construction from reasonably foreseeable future actions would be **negligible** adverse because impacts can be avoided by routing design and standard cable protection techniques.	**Offshore:** Because the impact would be slightly reduced regardless of configuration selected, all offshore impacts under Alternatives C through F would be slightly reduced compared to the Proposed Action. The effects of this IPF would be the same or slightly reduced relative to those described for the Proposed Action and would therefore be **negligible to minor** adverse for construction and O&M and **negligible** adverse for cumulative impacts.				**Offshore:** Under Alternative G, fewer WTG locations would be approved by BOEM. Because all offshore impacts would be slightly reduced compared to the Proposed Action, the effects of this IPF would be the same or slightly reduced relative to the Proposed Action and would therefore be **negligible to minor** adverse for construction and O&M and **negligible** adverse for cumulative impacts.
Vessel traffic	**Offshore:** Increased vessel traffic due to construction and installation of future offshore wind activities could interfere with vessels used to install or maintain existing and future undersea cables, or lead to course changes of vessels used for undersea cable maintenance and installation and increased traffic along vessel transit routes. However, given the infrequency of required maintenance at any given location along a cable route, the effects of vessel traffic on undersea cables under the No Action Alternative would be **negligible** adverse.	**Offshore:** Increased vessel traffic due to construction and installation of the Proposed Action could interfere with vessels used to install or maintain existing and future undersea cables. Additionally, there would be increased risk for allisions with vessels used for construction and O&M of undersea cables. These effects are expected to be minimal and short term. Therefore, the effects of vessel traffic on undersea cables under the Proposed Action would be **negligible** adverse. The cumulative impact from vessel traffic on undersea cables would be **negligible** adverse.	**Offshore:** Vessel traffic associated with Alternatives C through F may result in slightly reduced vessel traffic in the Lease Area and around ports given the smaller offshore footprint. Reduced navigational complexity combined with a smaller construction footprint and fewer offshore structures would result in the effects of this IPF being the same or slightly reduced relative to those described for the Proposed Action. Therefore, impacts on undersea cables would be **negligible** adverse.				**Offshore:** Alternative G may result in slightly reduced vessel traffic in the Lease Area and around ports given the smaller offshore footprint. Reduced navigational complexity combined with a smaller construction footprint and fewer offshore structures would result in the effects of this IPF being the same or slightly reduced relative to the Proposed Action. Therefore, impacts on undersea cables would be **negligible** adverse.

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3.17.2.2 Alternative A: Impacts of the No Action Alternative on Aviation and Air Traffic

3.17.2.2.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for aviation and air traffic (see Section 3.17.1) would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities and by permitted and constructed offshore wind COP projects within the GAA. These IPFs are described and analyzed in Appendix E1.

3.17.2.2.2 Cumulative Impacts

This section discloses potential aviation and air traffic impacts associated with future offshore wind development (without the Proposed Action). The cumulative impact analysis for the No Action Alternative for planned non-offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E1.

<u>Aviation and air traffic:</u> Future offshore wind activities without the Proposed Action could result in increased air traffic due to the use of helicopters and other aircraft during construction and installation, O&M, and decommissioning of future wind projects. While the exact increase in future project-related flights is unknown, it is anticipated that future offshore wind activities would result in an increase in flight traffic for construction, ongoing wildlife surveys, and (search and rescue) SAR related to offshore wind project vessel traffic. Based on FAA (2022) data, the Proposed Action would conservatively add up to 7% to FAA-reported air traffic in the GAA for all aircraft types per year during the construction and decommissioning phases and 0.1% during O&M. It can be assumed, therefore, that other wind activities could result in similar air traffic increases, with future projects potentially overlapping in construction and/or decommissioning phases. These simplified assumptions are conservative, likely overestimate future air traffic, and do not account for aircraft concentration near New England region airports. Future offshore wind project air traffic would be required to engage the FAA in flight planning to avoid impacts to civilian, commercial, government, and military aviation operations. With implementation of FAA-approved flight plans, impacts of the No Action Alternative on aviation and air traffic would be **negligible** adverse.

<u>Light:</u> Future offshore wind activities without the Proposed Action would result in an increase in permanent aviation warning lighting on WTGs offshore. All existing stationary structures would have navigation marking and lighting in accordance with FAA, USCG, and BOEM guidance to minimize collision risks and optimize aviation safety. The addition of up to 1,015 lighted structures represents a substantive increase in the number and extent of aviation and navigation safety lighting systems operating within the GAA, an area that includes lighting from military, commercial, and construction vessels; vessel-related lighting such as buoys and towers; and onshore lighting from housing and ports. Therefore, the effects of light on aviation and air traffic under the No Action Alternative would be **minor** adverse.

<u>Port utilization:</u> There may be a minimal increase in vessel use at ports associated with the No Action Alternative. The number of construction vessels would increase due to future offshore wind activities without the Proposed Action, which could result in delays and congestion at ports and lead to potential conflicts with air traffic due to increased activity in the vicinity of the airports listed in Section 3.17.1.1. Port improvements and construction activities in or near ports may require alteration of navigation patterns at nearby airports. Navigational hazards and collision risks at ports and in transit routes would be

reduced as construction is completed, and all navigation hazards and collision risks would be gradually eliminated during decommissioning as offshore WTGs are removed. In addition, vessel traffic would be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Therefore, port utilization is expected to have a **negligible** adverse effect on aviation and air traffic.

<u>Presence of structures:</u> Future offshore wind development could add up to 1,015 structures to the offshore environment in the analysis area. WTGs could have maximum blade tip height of 1,171 feet (357 m) amsl. Addition of these structures would noticeably increase navigational complexity and change aircraft navigation patterns in the region around the leased areas offshore Massachusetts and Rhode Island, along transit routes between ports and construction sites, and locally around ports (see Port Utilization). These changes could compress lower-altitude aviation activity into more limited airspace in these areas, leading to airspace conflicts or congestion, and increasing collision risks for low-flying aircraft. However, open airspace around the RI and MA Lease Areas would still be available over the open ocean, and ports used for offshore WTG construction would be planned and developed to accommodate tall structures.

Open airspace around the Lease Areas would still exist after all foreseeable future offshore wind energy projects are built. BOEM assumes that offshore wind project operators would coordinate with aviation interests throughout the planning, construction and installation, O&M, and decommissioning process to avoid or minimize impacts on aviation activities and air traffic. For this reason, the effects of increased presence of structures to aviation and air traffic under the No Action Alternative are anticipated to be **minor** adverse.

<u>Vessel traffic</u>: Although no future non–offshore wind stationary structures were identified within the Lease Area, vessel traffic associated with future offshore wind projects located outside the Lease Area would result in increased vessel traffic in the RI/MA WEA and surrounding ports. The impacts of increased vessel traffic are discussed above under Port Utilization and Presence of Structures. Vessel traffic is expected to have a **negligible** adverse effect on aviation and air traffic because vessel traffic would be spread throughout a large geographic area, and while construction time frames may overlap, it is anticipated that the increase in vessel traffic would not impact aviation and air traffic.

3.17.2.2.3 Conclusions

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and decommissioning would not occur; and potential impacts on other marine uses associated with the Project would not occur. However, ongoing and future activities would have **minor** adverse impacts on aviation uses due to the presence of structures that introduce navigational complexities.

BOEM anticipates that impacts to aviation uses from the combination of most ongoing activities and reasonably foreseeable activities other than offshore wind would be **negligible** adverse because any issues with aviation routes would be resolved through coordination with the FAA, as well as through implementation of navigational marking of structures according to FAA, USCG, and BOEM requirements and guidelines.

Considering all the IPFs together, BOEM anticipates that the impacts associated with future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would result in **minor** adverse impacts for aviation uses.

3.17.2.3 Alternative A: Impacts of the No Action Alternative on Land-Based Radar

3.17.2.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for land-based radar (see Section 3.17.1) would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities and by permitted and constructed offshore wind COP projects within the GAA. These IPFs are described and analyzed in Appendix E1.

3.17.2.3.2 Cumulative Impacts

This section discloses potential aviation and land-based radar impacts associated with future offshore wind development (without the Proposed Action). The cumulative impact analysis for the No Action Alternative for planned non-offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E1.

Presence of structures: WTGs that are near or in direct line-of-sight to land-based radar systems can interfere with the radar signal causing shadows or clutter in the received signal. WTGs can also affect HF radar measurements of coastal ocean currents, oil spill tracking, and vessel drift tracking (BOEM 2020). Modeling completed on behalf of BOEM (2020) shows that small aircraft detection interference would occur in the vicinity of each WTG. Construction of 1,036 structures in the RI/MA WEA could lead to long-term, **minor** adverse cumulative impacts to radar systems. Although these structures would be sited at such a distance from existing and proposed land-based radar systems to minimize interference to most radar systems, event-based operational changes and modification of some land-based radar may be necessary. Event-based operational change may include wind farm curtailment agreements for BOEM lease areas that would cease wind farm operations when HF radar efficiency is essential, such as in the event of a severe hurricane/tropical storm or a large oil spill. Trockel et al. (2021) also developed the initial version of a software upgrade for land-based HF radar to minimize impacts from offshore wind energy facilities, and this software upgrade has been transferred to NOAA's Integrated Ocean Observing System, which is currently testing the software for operational deployment. For vessel-based radar, the final Massachusetts and Rhode Island port access route study (USCG 2020) concludes that general mitigation measures, such as properly trained vessel-based radar operators, properly installed and adjusted vessel equipment, marked wind turbines, and the use of AIS would enable safe navigation in the GAA with minimal loss of radar detection.

Vessel traffic: Although no future non–offshore wind stationary structures were identified within the Lease Area, construction and operational vessel traffic from future offshore wind development outside the Lease Area is expected to increase. This could impact land-based radar by increasing the number of vessels in the analysis area. BOEM assumes that all offshore wind developments in the GAA would use the developer agreed upon 1 × 1–nm spacing that aligns with other proposed adjacent offshore wind projects in the RI/MA WEA. This would allow more space for vessels to navigate and would help reduce potential interference on radar systems. As a result, the effects of vessel traffic on land-based radar under the No Action Alternative would be **minor** adverse.

3.17.2.3.3 Conclusions

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and decommissioning would not occur; and potential impacts on other marine uses associated with the Project would not occur. However, ongoing and future activities would have **minor** adverse impacts on other marine uses due to the presence of structures that increase radar interference.

BOEM anticipates that impacts to radar would be **negligible** adverse for any individual ongoing and reasonably foreseeable activity other than offshore wind because any issues with radar systems would be resolved through coordination with the Department of Defense (DOD) or FAA.

Considering all the IPFs together, BOEM anticipates that the impacts associated with future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would result in notable and **moderate** adverse impacts to radar systems due to combined WTG interference.

3.17.2.4 Alternative A: Impacts of the No Action Alternative on Military and National Security (including Search and Rescue)

3.17.2.4.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for military and national security (including search and rescue) (see Section 3.17.1) would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities and by permitted and constructed offshore wind COP projects within the GAA. These IPFs are described and analyzed in Appendix E1.

3.17.2.4.2 Cumulative Impacts

This section discloses potential military and national security (including search and rescue) impacts associated with future offshore wind development (without the Proposed Action). The cumulative impact analysis for the No Action Alternative for planned non-offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E1.

<u>Anchoring and new cable emplacement/maintenance:</u> Up to 19,976 acres could be affected by anchoring and mooring activities and cable installation during offshore wind energy development within the analysis area. This offshore energy facility construction of new cable emplacement and maintenance of cables would involve increased vessel traffic which could impact military and national security uses by increasing the number of vessels within the analysis area. Increased vessel traffic due to anchoring and cable maintenance of wind facilities could lead to course changes of military vessels, thereby increasing navigational complexity and risk of collisions. However, these impacts are expected to be low because military vessels would largely travel in transit lanes, with the exception of SAR operations, and short term due to the limited amount of cable emplacement and maintenance expected from future offshore wind activities. Therefore, the effects of anchoring and new cable emplacement and maintenance under the No Action Alternative on military and national security would be **negligible** adverse**.**

<u>Aviation and air traffic:</u> Future offshore wind activities could result in increased air traffic due to the use of helicopters and other aircraft during construction and installation, O&M, and decommissioning of future wind projects that in turn may increase the necessity for data collection and SAR operations. While

the exact increase in future project-related flights is unknown, it is anticipated that future offshore wind-related flight traffic would be low and would be unlikely to affect military use of the area in SAR and data collection activities. Future offshore wind projects would be required to engage the FAA in flight planning to avoid impacts to civilian, commercial, government, and military aviation operations. With implementation of FAA-approved flight plans, impacts of the No Action Alternative on military and national security would be **negligible** adverse**.**

Light: Future offshore wind activities would result in an increase in permanent aviation warning lighting on WTGs offshore. All existing stationary structures would have navigation marking and lighting in accordance with FAA, USCG, and BOEM guidance to minimize allision risks. Implementation of navigational lighting and marking per FAA and BOEM requirements and guidelines would further reduce the risk of military aircraft collisions. This increase in lighting would add to vessel and navigational lighting, as well as onshore housing and port lighting, in the GAA, which could have a negative impact on military and national. Therefore, the effects of light on military and national security under the No Action Alternative would be **minor** adverse.

Presence of structures: Installation of up to 1,015 structures in the RI/MA WEA, which currently supports only five offshore wind turbines associated with the BIWF, as well as several meteorological buoys (see Appendix E1), would impact military and national security vessels primarily through risk of allision and collision with stationary structures and other vessels. Vessels could directly allide with WTG foundations. Vessel traffic would increase during project construction, and once the WTGs are operational, the artificial reef effect created by offshore structures could attract commercial and recreational fishing vessels. This would increase the risk of vessel collisions and increase navigation complexity, leading to potential use conflicts. In general, risks to military and national security vessels would increase over time as additional wind energy facilities are built.

Military and national security vessels could allide with WTG structures. However, deep-draft military vessels are not anticipated to transit outside of navigation channels unless necessary for SAR (of people or marine mammals) or nontypical operations. Allision risks for smaller vessels moving within or near offshore wind structures would be higher. However, these risks would be minimized by projects adhering to structural lighting requirements according to the USCG and BOEM, which would provide lighting at sea level. Additionally, allision would be further mitigated by following a fixed 1 × 1–nm WTG layout proposed by offshore wind leaseholders to facilitate safe navigation through the offshore wind energy Lease Areas (Geijerstam et al. 2019).

Additionally, risk of collision with recreational fishing vessels could indirectly increase as a result of the artificial reef effect around the offshore wind facility structures. New artificial reef effects could attract recreational fishing vessels farther offshore than currently occurs, adding to existing vessel traffic and subsequently increasing the risk of collision with military and national security vessels. Furthermore, an increase in recreational vessels in and around offshore wind projects could increase the demand for USCG SAR operations (of people or marine mammals).

In addition to allision or collision risks, military and national security vessels may be impacted by offshore wind energy structures by the need to change routes and navigate around both project footprints and project-associated vessels, particularly during the construction periods between 2021 and 2030.

Furthermore, military and national security vessels may experience congestion and delays in port due to the increase in offshore wind facility vessels.

Military and national security aircraft would be impacted by the presence of tall equipment necessary for offshore wind facility construction, such as stationary lift vessels and cranes, which would increase navigational complexity in the area. Warning area W-105A measures approximately 23,000 square miles, with approximately 4% (approximately 1,000 square miles) overlaying the GAA (BOEM 2021). Military and national security operations conducted within W-105A would be impacted during construction and operation periods. However, it is assumed all offshore wind energy project operators would coordinate with relevant agencies during the COP development process to identify and minimize conflicts with military and national security operations.

Measures mitigating risks would include operational protocol to stop WTG rotation during SAR aircraft operations and implementation of FAA- and BOEM-recommended navigational lighting and marking to reduce the risk of aircraft collisions. Wind energy structures would be visible on military and national security vessel and aircraft radar. Nonetheless, the presence and layout of large numbers of WTGs could make it more difficult for SAR aircraft to perform operations (of people or marine mammals), leading to less effective search patterns or earlier abandonment of searches. This could result in otherwise avoidable loss of life due to maritime incidents.

Navigational hazards would gradually be eliminated as structures are removed. Based on coordinating efforts and the anticipated mitigating measures discussed above, the overall impacts to military and national security uses are anticipated to be **moderate** adverse under the No Action Alternative.

Vessel traffic: Although no future non–offshore wind stationary structures were identified within the Lease Area, increased vessel traffic due to construction and decommissioning of future offshore wind facilities outside the Lease Area could lead to course changes of military and national security vessels, congestion and delays at ports, and increased traffic along vessel transit routes. Vessel activity could peak in 2025 with as many as 210 vessels involved in construction of reasonably foreseeable projects. While construction periods of various wind energy facilities may be staggered, some overlap would result in a cumulative impact to traffic loads. Therefore, the effects of vessel traffic on military and national security under the No Action Alternative would be **minor** adverse.

3.17.2.4.3 Conclusions

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and decommissioning would not occur; and potential impacts on other marine uses associated with the Project would not occur. However, ongoing and future activities would have **moderate** adverse impacts on military and national security uses due to the presence of structures that introduce navigational complexities and vessel traffic.

BOEM anticipates that impacts to military and national security uses from the combination of most ongoing activities and reasonably foreseeable activities other than offshore wind would be **negligible** adverse because BOEM anticipates that any issues with the military or national security would be resolved through coordination with the DOD, as well as through implementation of navigational marking of structures according to FAA, USCG, and BOEM requirements and guidelines.

Considering all the IPFs together, BOEM anticipates that the impacts associated with future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would result in **moderate** adverse impacts for military and national security uses.

3.17.2.5 Alternative A: Impacts of the No Action Alternative on Scientific Research and Surveys (see section in main EIS)

3.17.2.6 Alternative A: Impacts of the No Action Alternative on Undersea Cables

3.17.2.6.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for undersea cables (including search and rescue) (see Section 3.17.1) would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities and by permitted and constructed offshore wind COP projects within the GAA. These IPFs are described and analyzed in Appendix E1.

3.17.2.6.2 Cumulative Impacts

This section discloses potential undersea cables impacts associated with future offshore wind development (without the Proposed Action). The cumulative impact analysis for the No Action Alternative for planned non-offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E1.

<u>Presence of structures:</u> Up to 1,015 structures could be installed between 2021 and 2030 in the RI/MA WEA as part of future offshore wind energy project infrastructure. The presence of future offshore wind energy structures could preclude future submarine cable placement, as discussed in Appendix E2 in "Anchoring and new cable emplacement/maintenance." Installed WTGs and OSSs and stationary lift vessels used during construction that are located near existing submarine cables could pose allision risks and navigational hazards to vessels conducting maintenance activities on these cables. The future development of multiple wind energy projects could increase the complexity of undersea cable development by requiring routing around the facilities. Export cables are unlikely to preclude future undersea cable development because cable crossings can be protected using standard design techniques. Therefore, in context of reasonably foreseeable environmental trends, the overall impacts from the presence of structures resulting from ongoing and planned actions are anticipated to be localized long term **negligible** adverse because impacts can be avoided by routing design and standard cable protection techniques.

<u>Vessel traffic:</u> Although no future non–offshore wind stationary structures were identified within the Lease Area, increased vessel traffic due to construction and installation of future offshore wind activities located outside the Lease Area could interfere with vessels used to install or maintain existing and future undersea cables. Increased vessel traffic due to Project construction and installation, O&M, and decommissioning could lead to course changes of vessels used for undersea cable maintenance and installation and increased traffic along vessel transit routes. The risk of allision to cable maintenance vessels could increase as more offshore wind energy projects are constructed. However, given the infrequency of required maintenance at any given location along a cable route, this risk is expected to be low. Therefore, the effects of vessel traffic on undersea cables under the No Action Alternative would be **negligible** adverse**.**

3.17.2.6.3 Conclusions

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and decommissioning would not occur; and potential impacts on other marine uses associated with the Project would not occur. Ongoing and future activities would have **negligible** adverse impacts on undersea cables due to the presence of offshore wind energy cables or structures that could preclude future submarine cable placement and vessel traffic.

BOEM anticipates that impacts to undersea cables from the combination of most ongoing activities and reasonably foreseeable activities other than offshore wind would be **negligible** adverse because BOEM anticipates that cables could be easily crossed by vessels and existing cables require minimal maintenance.

Considering all the IPFs together, BOEM anticipates that the impacts associated with future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would result in **negligible** adverse impacts on undersea cables.

3.17.2.7 Alternative B: Impacts of the Proposed Action on Aviation and Air Traffic

3.17.2.7.1 Construction and Installation

Offshore Activities and Facilities

<u>Aviation and air traffic:</u> The Proposed Action would result in an increase in air traffic related to construction and installation of offshore Project elements. Project construction would result in one to two helicopter flights to and from the Lease Area per day for construction of the foundations. Helicopters would also be used for additional crew transfers during construction activities. Estimated helicopter use for the RWF during the construction phase is estimated to be less than 200 helicopter trips and approximately 8,832 hours of flight time over the 2-year construction period (COP Appendix T [Tech Environmental 2023]). Based on national aviation statistics (FAA 2020), general aviation aircraft logged an estimated 792,266 hours of total flight in the FAA's New England Region in 2019. Extrapolating from nationwide statistics, helicopters would account for approximately 93,000 hours of the New England Region total. The Proposed Action would require a total estimated 8,832 hours of helicopter flight time for Project construction and installation, or approximately 4,416 flight hours per year, over the 2-year construction period of the Project. The GAA represents approximately 8% of the 160,000 square miles of airspace in the FAA New England Region. Applying this proportion, helicopter flights for Project construction and installation would represent a 63% increase in annual helicopter flight hours and a 7% increase in general aviation hours in the GAA. The effect determination is based on the 7% increase in general aviation hours in the GAA, as the increase in helicopter hours specifically would not have a direct impact on aviation and air traffic compared to the general overall increase in aircraft in the GAA. When estimation uncertainty is considered, the 7% increase in Project-related air traffic over the 2-year construction period represents a **minor** adverse effect on general aviation air traffic. A helicopter route plan would be developed to meet industry guidelines and best practices in accordance with FAA guidance. Additionally, all aviation operations, including flying routes and altitude, would be aligned with relevant stakeholders, such as the FAA. On this basis, the effects of Project-related aviation and air traffic on aviation and air traffic under the Proposed Action would be **minor** adverse.

Lighting: During construction and installation, WTGs would be marked with appropriate lighting to meet FAA warning guidelines and would be visible on the radar systems of low-flying aircrafts, similar to other large-scale sea surface activity. Therefore, impacts to aviation and air traffic would be **negligible** adverse.

Port utilization: Various ports would be improved to support the Proposed Action (see Section 3.14). These improvements would occur within the boundaries of existing port facilities, would be similar to existing activities at the existing ports, and would support state strategic plans and local land use goals for the development of waterfront infrastructure. The number of construction vessels would increase due to future offshore wind activities without the Proposed Action which could result in delays and congestion at ports which could lead to potential conflicts with air traffic due to increased activity in the vicinity of the airports listed in Section 3.17.1. Port improvements and construction activities in or near ports may require alteration of navigation patterns at nearby airports; however, port improvements are anticipated to occur under the No Action Alternative to support regional offshore wind energy industry development. Navigational hazards and collision risks at ports and in transit routes would be reduced as construction is completed. However, vessel traffic would also be spread among multiple ports to ensure that sufficient capacity exists at each port and in each waterway. Therefore, port utilization is expected to have a **negligible** adverse effect on aviation and air traffic.

Presence of structures: The Proposed Action would add up to 100 WTGs with maximum blade tip heights of up to 853 feet amsl. The addition of these structures would increase navigational complexity and could change aircraft navigation patterns for aircraft flying at low altitudes and for airports in the vicinity, increasing collision risks for some aircraft during the Proposed Action's operational timeframe. However, more than 90% of existing air traffic in the analysis area would occur at altitudes that would not be impacted by the presence of WTGs (BOEM 2021).

For the air traffic that occurs at altitudes that could be impacted by the presence of WTGs, the FAA conducts aeronautical studies to ensure that proposed structures do not have an effect on air navigation safety and the ability of aircraft to efficiently use navigable airspace. Proposed structures are considered as having an adverse effect if they exceed obstacle clearance surfaces.

An air traffic flow analysis for the Project was completed (Capitol Airspace Group 2020). WTGs at a height of 873 above sea level (ASL) could affect Visual Flight Rules (VFR) routes, requiring an increase to a Block Island State Airport (BID) instrument approach minimum altitude, Boston Consolidated (A90) Terminal Radar Approach Control (TRACON) minimum vectoring altitudes (MVAs), and Providence (PVD) TRACON MVAs.

However, historical air traffic data indicates that 873-foot ASL wind turbines would not affect any regularly used VFR routes. Additionally, historical air traffic data indicates that the required changes to the BID instrument approach procedure, A90 TRACON MVA sectors and PVD TRACON MVA sectors, should not affect a significant volume of operations. As a result of these findings, it possible that the FAA would be willing to increase the affected altitudes in order to accommodate wind development up to 873 feet ASL. These mitigation options are available and subject to FAA approval. Therefore, the effects of the presence of structures on aviation and air traffic under the Proposed Action would be **negligible** adverse.

Vessel traffic: Vessel traffic associated with the Proposed Action would result in increased vessel traffic in the Lease Area and around ports. Construction of offshore structures would noticeably increase navigational complexity along transit routes between ports and construction sites, and locally around ports due to increased vessel traffic. Increased vessel traffic is expected to have a **negligible** adverse effect on aviation and air traffic because vessel traffic would be spread throughout a large geographic area and would occur over a short period of time.

3.17.2.7.2 Operations and Maintenance and Decommissioning

Offshore Activities and Facilities

Aviation and air traffic: The Proposed Action would result in an increase in air traffic related to O&M and decommissioning of the Proposed Action. A hoist-equipped helicopter may be used to support O&M (VHB 2023). Table 3.5-5 in the COP provides a summary of O&M support vessels that are currently being considered to support Project O&M. The type and number of vessels and helicopters would vary over the operational lifetime of the Project.

During O&M, helicopters would be used to provide supplemental means of access when vessel access is not practical or desirable. Flights would be currently restricted to daylight operations when visibility is good. Helicopters would be used for two different purposes to support O&M:

- Helicopter hoist operations: An integrated helicopter hoist platform located on the roof of each WTG nacelle would provide access for O&M. SOVs and the OSSs may also be fitted with helicopter hoist platforms. The purpose of this effort is primarily for transport and transfer of technical personnel and equipment on to/from the WTGs via hoist to the nacelle but can also be conducted for transport and transfer of personnel and equipment to offshore installations that do not have a helideck. This is the most common means of access in the O&M phase and is typically used to perform minor repairs and restarts.
- Transport and transfer operations: Transport helicopter operations are flights from an onshore airport or heliport to an offshore installation or vessel with a helideck and back. Transfer helicopter operations are flights within the WEA from an offshore installation or vessel with a helideck to another, and back.

All aviation operations, including flying routes and altitude, would be aligned with relevant stakeholders, such as the FAA. It is anticipated that there would be up to 800 helicopter trips and a total flight time of up to 252 hours of flight time for O&M of the Project (Tech Environmental 2023). Based on national aviation statistics (FAA 2020), general aviation aircraft logged an estimated 792,266 hours of total flight in the FAA's New England Region in 2019. Extrapolating from nationwide statistics, helicopters would account for approximately 93,000 hours of the New England Region total. The Proposed Action would require an estimated 252 hours of helicopter flight time for project O&M, or approximately 8.4 flight hours per year, over the 35-year operating period of the Project. The GAA represents approximately 8% of the 160,000 square miles of airspace in the FAA New England Region. Applying this proportion, helicopter flights for Project O&M would represent a 0.1% increase in annual helicopter flight hours and a 0.01% increase in general aviation hours in the GAA. When estimation uncertainty is considered, this represents a **negligible** adverse effect on general aviation air traffic. On this basis, the effects of Project-related aviation and air traffic on aviation and air traffic under the Proposed Action would be **negligible** adverse.

Light: During O&M, WTGs would be marked with appropriate lighting to meet FAA warning guidelines and would be visible on the radar systems of low-flying aircrafts, similar to other large-scale sea surface activity. Decommissioning would have impacts similar to those during Project construction. Therefore, impacts to aviation and air traffic would be **negligible** adverse**.**

Port utilization: Various ports could be improved to support the Proposed Action (see Section 3.14). These improvements would likely occur within the boundaries of existing port facilities, similar to existing activities at the existing ports, and would support state strategic plans and local land use goals for the development of waterfront infrastructure. Navigational hazards and collision risks at ports and in transit routes would be reduced as construction is completed, and all navigation hazards and collision risks would be gradually eliminated during decommissioning as offshore WTGs are removed. However, vessel traffic would also be spread among multiple ports to ensure that sufficient capacity exists at each port and in each waterway. Therefore, port utilization is expected to have a **negligible** adverse effect on aviation and air traffic.

Presence of structures: The Proposed Action would add up to 100 WTGs and two OSSs having maximum blade tip and structure heights of up to 853 feet and 180 feet amsl, respectively. The addition of these structures would increase navigational complexity and could change aircraft navigation patterns for aircraft flying at low altitudes and for airports in the vicinity, increasing collision risks for some aircraft during the Proposed Action's operational time frame. However, more than 90% of existing air traffic in the analysis area would occur at altitudes that would not be impacted by the presence of WTGs (BOEM 2021). An air traffic flow analysis completed by Capitol Airspace found that it is possible that the FAA would be willing to increase the affected altitudes in order to accommodate wind development up to 873 feet above sea level (ASL) (Capitol Airspace Group 2020). Decommissioning would have impacts similar to those during Project construction. Therefore, the effects of the presence of structures on aviation and air traffic under the Proposed Action would be **negligible** adverse**.**

Vessel traffic: Vessel traffic associated with the Proposed Action would result in increased vessel traffic in the Lease Area and around ports. Addition of offshore structures would noticeably increase navigational complexity along transit routes between ports and construction sites, and locally around ports. Increased vessel traffic is expected to have a **negligible** adverse effect on aviation and air traffic because vessel traffic would be spread throughout a large geographic area and would be short term.

Onshore Activities and Facilities

Light: Operational lighting onshore would be limited to the OnSS and ICF, which would have minimal yard lighting and task lighting (see Section 3.14). This lighting is minimal and would not result in impacts to aviation and air traffic. Decommissioning would have impacts similar to those during Project construction. Therefore, the effects of light on aviation and air traffic under the Proposed Action would be **negligible** adverse**.**

Port utilization: Ports would be primarily used during construction and installation of the Proposed Action, as ports would be used for staging WTGs and for mobilizing construction work. Decommissioning would have impacts similar to those during Project construction. There would be no impacts to aviation and air traffic from O&M and decommissioning of the Proposed Action; therefore, impacts would be **negligible** adverse**.**

Presence of structures: The O&M of onshore structures to support the Proposed Action would not impact aviation and air traffic. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.

Vehicle traffic: Onshore vehicle traffic in and around ports and onshore facilities may increase as a result of O&M and decommissioning of the Proposed Action. Project-related vehicle traffic would not impact aviation and air traffic because these uses are generally spatially separate from vehicular traffic and occur in different locations. Therefore, this IPF would result in a **negligible** adverse impact because minimal increases in vehicle traffic would not impact aviation and air traffic.

3.17.2.7.3 Cumulative Impacts

Offshore Activities and Facilities

Aviation and air traffic: The Proposed Action would result in approximately 4,416 construction flight hours per year during construction and installation over a 2-year construction period, then the flight hours would significantly decrease to approximately 8.4 flight hours per year during O&M and decommissioning of the RWF. During construction and installation this results in a 7% increase in general aviation air traffic in the GAA and during O&M and decommissioning this results in a 0.01% increase in general aviation air traffic in the GAA. In total, there would be an average of 303 flight hours per year over 32 years (2-year construction period and up to 35-year operational period). This represents a 4% yearly increase in helicopter flight hours in the GAA and a 1% yearly increase in general aviation flight hours. Future offshore wind activities without the Proposed Action could also result in increased air traffic due to the use of helicopters and other aircraft during construction and installation, O&M, and decommissioning of future wind projects. While the exact increase in future Project-related flights is unknown, it is anticipated that reasonably foreseeable future wind activities would also result in increases in flight traffic similar in scale to the Proposed Action. The Proposed Action and reasonably foreseeable future wind projects would be required to engage the FAA in flight planning to avoid impacts to civilian, commercial, government, and military aviation operations. Therefore, the Proposed Action when combined with past, present, and other reasonably foreseeable project impacts would result in **negligible** adverse impacts on aviation and air traffic.

Light: The Proposed Action would add permanent lighting for up to 100 WTGs and 2 OSSs for the duration of the Project. BOEM estimates a maximum cumulative total of up to 1,117 offshore WTGs and OSS foundations for the Proposed Action plus all other future offshore wind projects in the GAA. All existing stationary structures would have navigation marking and lighting in accordance with FAA, USCG, and BOEM guidelines to minimize collision and allision risks. WTGs would also be visible on aircraft radar. Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be similar to those impacts described under the No Action Alternative and would have a **negligible** adverse impact on aviation and air traffic.

Port utilization: The Proposed Action combined with reasonably foreseeable future actions could result in a very minimal increase in vessel use at ports, most of which would be during construction and decommissioning of the Project. The number of construction vessels would increase due to both the Proposed Action and reasonably foreseeable future actions, which could result in delays and congestion at ports and lead to potential conflicts with air traffic due to increased activity in the vicinity of the airports listed in the Affected Environment. Port improvements and construction activities in or near ports may require alteration of navigation patterns at nearby airports. Navigational hazards and collision risks at ports and in transit routes would be reduced as construction is completed, and all navigation hazards and collision risks would be gradually eliminated during decommissioning as offshore WTGs are removed. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Therefore, the Proposed Action when combined with past, present, and other reasonably foreseeable project impacts would result in a **negligible** adverse impact on aviation and air traffic.

Presence of structures: The Proposed Action structures represent a 10% increase over total estimated WTG and OSS foundations across the GAA under the No Action Alternative. BOEM estimates a cumulative total of up to 1,117 offshore WTGs and OSS foundations for the Proposed Action plus all other future offshore wind projects in the RI/MA WEA. WTGs could have maximum blade tip height of 1,171 feet amsl.

Addition of these structures would noticeably increase navigational complexity and change aircraft navigation patterns in the region around the leased areas offshore Massachusetts and Rhode Island, along transit routes between ports and construction sites, and locally around ports (see Port utilization). These changes could compress lower-altitude aviation activity into more limited airspace in these areas, leading to airspace conflicts or congestion, and increasing collision risks for low-flying aircraft. However, open airspace around the GAA would still be available over the open ocean, and ports used for offshore WTG construction would be planned and developed to accommodate tall structures.

Open airspace would continue to exist around all Lease Areas after the Proposed Action and reasonably foreseeable future offshore wind energy projects are built. BOEM assumes that offshore wind project operators would coordinate with aviation interests throughout the planning, construction and installation, O&M, and decommissioning process to avoid or minimize impacts on aviation activities and air traffic. Therefore, the Proposed Action when combined with past, present, and other reasonably foreseeable Project impacts would result in a **minor** adverse impact on aviation and air traffic.

Vessel traffic: Vessel traffic associated with the Proposed Action and reasonably foreseeable future actions would result in increased vessel traffic in the GAA. The impacts of increased vessel traffic are discussed above under Port Utilization and Presence of Structures. Vessel traffic would be spread throughout a large geographic area, and while construction time frames may overlap, it is anticipated that the increase in vessel traffic would not impact aviation and air traffic. Therefore, the Proposed Action when combined with past, present, and other reasonably foreseeable Project impacts would result in a **minor** adverse impact on aviation and air traffic.

Onshore Activities and Facilities

Lighting: It is not anticipated that any of the onshore Project components for the Proposed Action or reasonably foreseeable future actions would require FAA-compliant lighting. Therefore, the Proposed Action when combined with past, present, and other reasonably foreseeable Project impacts would result in **negligible** adverse impacts on aviation and air traffic from light.

Port utilization: WTG components located at staging ports could result in issuance of notices to airmen, causing some aircraft to reroute. WTG components would be in staging ports for brief periods. It is expected that reasonably foreseeable future actions would have similar port utilization impacts that account for construction and installation, O&M, and decommissioning of future actions. Therefore, cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **minor** adverse on aviation and air traffic.

Presence of structures: The construction and installation, O&M, and decommissioning of the Proposed Action and other reasonably foreseeable onshore structures would not contribute to cumulative impacts on aviation and aircraft because onshore structures are sited in industrial and commercial areas away from aviation uses. The presence of onshore structures would also be limited to O&M facilities, the OnSS, and ICFs that are similar in nature to surrounding land uses and would not create impacts on aviation uses. It is expected that reasonably foreseeable future actions would have similar structure impacts that account for construction and installation, O&M, and decommissioning of future actions. Therefore, cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **negligible** adverse on aviation and air traffic.

Vehicle traffic: Onshore vehicle traffic surrounding ports and onshore facilities may increase as a result of the Proposed Action, but it would not impact aviation and air traffic because these uses are spatially separate from vehicular traffic and occur in different locations. Additionally, it is anticipated that vehicular traffic would also increase at onshore wind facilities and port facilities as a result of reasonably foreseeable future actions. It is expected that vehicular traffic increases would be commensurate with the impacts expected for the Proposed Action in scale, intensity, and duration. Therefore, the Proposed Action combined with reasonably foreseeable future actions would result in a **negligible** adverse impact because minimal increases in vehicle traffic would not impact aviation and air traffic.

3.17.2.7.4 Conclusions

Project construction and installation, O&M, and decommissioning would affect ongoing aviation and air traffic occurring in the analysis area. Similar impacts from Project O&M would occur, although at a lesser extent and duration for aviation and air traffic. BOEM anticipates the impacts resulting from the Proposed Action alone would result in **negligible** adverse impacts on aviation and air traffic that would primarily be caused by installation of WTGs in the GAA due to potential changes in navigational patterns.

In the context of other reasonably foreseeable environmental trends and planned actions, the impacts under the Proposed Action resulting from individual IPFs range from **negligible** to **minor** adverse. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be **minor** adverse impacts for aviation and air traffic.

3.17.2.8 Alternative B: Impacts of the Proposed Action on Land-Based Radar

3.17.2.8.1 Construction and Installation

Offshore Activities and Facilities

Presence of structures: Construction and installation of offshore Project components could result in impacts to land-based radar by introducing potential obstacles to radar coverage in the RI/MA WEA. These impacts would be less than those identified for Project O&M and discussed in Section 3.17.2.3.2 Therefore, the construction and installation of offshore Project components would result in **negligible** adverse impacts to land-based radar.

Vessel traffic: There would be increased construction and operational vessel traffic from the Proposed Action, but the increase would not represent a substantial change to vessel traffic volume, which includes numerous ports and extensive marine traffic related to shipping, fishing, and recreation. As a result, the effects of vessel traffic on land-based radar under the Proposed Action would be **negligible** adverse.

3.17.2.8.2 Operations and Maintenance and Decommissioning

Offshore Activities and Facilities

Presence of structures: WTGs that are near or in direct line of sight to land-based radar systems can interfere with the radar signal by causing shadows or clutter in the received signal. Construction of 102 structures in the Lease Area could lead to impacts to land-based radar systems identified in Appendix S2 of the COP. The radar line of sight study (Westslope 2021) determined the following radar impacts by the presence of WTGs at a height of 873 amsl:

- For the Falmouth ASR-8, wind turbines in the northeastern two-thirds of the study area would be within the line of sight of and would interfere with this radar site at a blade-tip height of 873 feet above ground level (AGL).[2]
- For the Nantucket ASR-9, wind turbines in the eastern one-half of the study area would be within the line of sight of and would interfere with this radar site at a blade-tip height of 873 feet AGL.
- For the Providence ASR-9, wind turbines in the entire study area would be within the line of sight of and would interfere with this radar site at a blade-tip height of 873 feet AGL.
- For the North Truro ARSR-4 and the Riverhead ARSR-4, wind turbines in the study area would not be within the line of sight of and would not interfere with these radar sites at a blade-tip height of 873 feet AGL.
- The EWR LOS analysis for the Cape Cod AFS EWR shows that wind turbines in the majority of the study area will be within the line of sight of this radar site and could have a significant impact on this early warning radar at a blade-tip height of 873 feet AGL.

For the Falmouth ASR-8, Nantucket ASR-9, and the Providence ASR-9, without mitigation, the radar effects due to clutter could include a partial loss of primary target detection and a number of false primary targets over and in the immediate vicinity of wind turbines within the radar line of sight in the study area. Other radar effects include a partial loss of weather detection and false weather indications over and in the immediate vicinity of wind turbines within the line of sight in the study area.

The HF radar LOS analyses show the following:

- For the Amagansett HF radar, wind turbines in the western corners of the study area would be within the line of sight of this radar site at a blade-tip height of 873 feet AGL.
- For the Block Island Long Range HF radar, Camp Varnum HF radar, Horseneck Beach State Reservation HF radar, Long Point Wildlife Refuge HF radar, and the Martha’s Vineyard HF radar, wind turbines in the entire study area would be within the line of sight of these radar sites at a blade-tip height of 873 feet AGL.

[2] Height AGL used by Westslope (2021) is equivalent to height amsl as defined in Section 2.1.2.1, Table 2.1-1.

- For the Block Island Standard Range HF radar, wind turbines in the western two-thirds of the study area would be within the line of sight of this radar site at a blade-tip height of 873 feet AGL.
- For the MVCO Meteorological Mast HF radar, wind turbines in the eastern one-fifth of the study area would be within the line of sight of this radar site at a blade-tip height of 873 feet AGL.
- For the Nantucket HF radar, wind turbines in the eastern one-third of the study area would be within the line of sight of this radar site at a blade-tip height of 873 feet AGL.
- For the Squibnocket Farms HF radar, wind turbines in the eastern one-fifth and along the northern edges of the study area would be within the line of sight of this radar site at a blade-tip height of 873 feet AGL.
- For the Moriches HF radar, Nantucket Island HF radar, and the Nauset HF radar, wind turbines in the study area would not be within the line of sight of these radar sites at a blade-tip height of 873 feet AGL. Although wind turbines in the study area would not be within the line of sight of these radar sites, radar effects are still possible beyond line-of-sight due to the propagation of HF electromagnetic waves over the ocean surface.

Westslope (2021) concluded that, without mitigation, the Proposed Action could result in measurable effects on radar systems within their study area, including clutter in the vicinity of line-of-sight turbines and possibly in the vicinity of wind turbines beyond line-of-sight due to the propagation of HF electromagnetic waves over the ocean surface. These impacts could affect the following radar systems; the Amagansett HF radar, Block Island Long Range HF radar, Block Island Standard Range HF radar, Camp Varnum HF radar, Horseneck Beach State Reservation HF radar, Long Point Wildlife Refuge HF radar, Martha’s Vineyard HF radar, MVCO Meteorological Mast HF radar, Nantucket HF radar, and the Squibnocket Farms HF radar.

The VOR screening analysis for the Martha’s Vineyard VOR/DME, Providence VOR/DME, and the Sandy Point VOR/DME shows that the study area is greater than 8 nm from these navigational aid sites. Although possible, Revolution Wind does not anticipate that the FAA would have concerns with wind turbines in the study area at a blade-tip height of 873 feet AGL based on impacts to these navigational aid sites.

The NEXRAD weather radar screening analysis for the Boston WSR-88D and the Brookhaven WSR-88D shows that wind turbines in the study area would not be within the line of sight of and would not interfere with these radar sites at a blade-tip height of 873 feet AGL. The results also show that wind turbines in the study area at a blade-tip height of 873 feet AGL would fall within a NOAA green No Impact Zone for these radar sites.

The TDWR screening analysis for the Boston TDWR shows that the study area is beyond the instrumented range of this radar site. As such, no additional analysis was considered necessary for this radar site. In summary, there would be a **minor** adverse impact to air defense and homeland security radar and a **negligible** adverse impact on weather radar.

To address these concerns, BOEM would include terms and conditions in the COP approval requiring 30- to 60-day advanced notification to the North American Aerospace Defense Command ahead of Project completion and when the Project is complete and operational for radar management (RAM) scheduling, funding of RAM execution, and curtailment for national security or defense purposes, as described in the leasing agreement. Any other impacts on radar systems are anticipated to be mitigated by overlapping coverage and radar optimization. The FAA would evaluate potential impacts on radar systems, as well as mitigation measures, when Revolution Wind refiles Form 7460-1 for individual WTGs located within U.S. territorial waters. Revolution Wind’s marine coordinator would remain on duty for the life of the Proposed Action to liaise with military, national security, civilian, and private interests to reduce potential radar conflicts. BOEM’s (2020) study of radar interference concludes that HF SeaSonde radars, which monitor ocean currents, follow oil spills, and track powered and adrift vessels, are the most heavily impacted radar by offshore wind projects because WTGs create a phenomenon in which turbine echo is processed by these radar as current echo, resulting in interference with ocean current measurements. General mitigation measures determined by BOEM (2020) to be effective for HF radar include event-based operational changes and modification of some land-based radar. Event-based operational change may include wind farm curtailment agreements for BOEM lease areas that would cease wind farm operations when HF radar efficiency is essential, such as in the event of a severe hurricane/tropical storm or a large oil spill. BOEM is also working on developing a land-based HF radar software upgrade (Trockel et al. 2021), which has since been transferred to NOAA's Integrated Ocean Observing System for further testing and operational deployment.

The Proposed Action includes 1 × 1–nm WTG spacing that reduces, but does not eliminate, navigational complexity and space use conflicts during the operation phases of the Project. Navigational complexity in the area would remain constant during simultaneous operations and would decrease as the Project is decommissioned and structures are removed. The final Massachusetts and Rhode Island Port Access Route Study (USCG 2020) concludes that general mitigation measures, such as properly trained radar operators, properly installed and adjusted vessel equipment, marked wind turbines, and the use of AIS all enable safe navigation with minimal loss of radar detection. Following the layout recommendations in the final Massachusetts and Rhode Island Port Access Route Study (USCG 2020) would improve safety, but it would not completely remove the risk of allisions or collisions with WTGs during SAR operations (of people or marine mammals), particularly in challenging weather or visibility conditions. Therefore, the effects of the presence of offshore structures on land-based radar under the Proposed Action would be **negligible** adverse**.**

<u>Vessel traffic:</u> Operational vessel traffic from the Proposed Action is expected to increase, although it would be less than during the construction and decommissioning phases. This could impact land-based radar by increasing the number of vessels in the analysis area. The Proposed Action includes 1 × 1–nm WTG spacing that allows more space for vessels to navigate and would help reduce potential interference on radar systems. As a result, the effects of vessel traffic on land-based radar under the Proposed Action would be **negligible** adverse**.**

3.17.2.8.3 Cumulative Impacts

Offshore Activities and Facilities

<u>Presence of structures:</u> The Proposed Action would result in long-term negligible adverse impacts to land-based radar when compared to conditions under the No Action Alternative. These structures would increase the long-term risk of radar interference or clutter.

BOEM's radar study (2020) suggests general mitigation measures, including event-based operational changes and modification of some land-based radar through software upgrades to reduce impacts. For vessel-based radar, the final Massachusetts and Rhode Island port access route study (USCG 2020) concludes that general mitigation measures, such as properly trained radar operators, properly installed and adjusted vessel equipment, marked wind turbines, and the use of AIS, all enable safe navigation with minimal loss of radar detection. BOEM would include approval conditions in the COP regarding notification to North American Aerospace Defense Command of RAM scheduling, funding of RAM execution, and curtailment for national security or defense purposes, as needed.

Therefore, the Proposed Action and past, present, and reasonably foreseeable activities would result in **minor** adverse impacts to land-based radar.

Vessel traffic: The Project Action would result in an increase of offshore vessels during every phase of the Project. The increase in vessels in the analysis area would result in long-term impacts to land-based radar due to increased potential for radar interference or clutter. Reasonably foreseeable activities are expected to also generate vessel traffic that would increase the number of vessels in the RI/MA WEA. Measures described under Presence of structures would reduce the cumulative impacts of increased vessel traffic to a **minor** adverse level when considering cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities.

3.17.2.8.4 Conclusions

Project construction and installation, O&M, and decommissioning would affect land-based radar occurring in the analysis area. Similar impacts from Project O&M would occur, although at a lesser extent and duration for some uses. BOEM anticipates the impacts on land-based radar resulting from the Proposed Action alone would be **minor** adverse, as the overall effect would be managed through event-based operational changes and radar equipment upgrades.

In the context of other reasonably foreseeable environmental trends and planned actions, the impacts under the Proposed Action resulting from individual IPFs would range from **negligible** to **minor** adverse. Considering all the IPFs together, BOEM anticipates that the overall cumulative impacts associated with the Proposed Action combined with past, present, and reasonably foreseeable activities, would be **moderate** adverse for land-based radar.

3.17.2.9 Alternative B: Impacts of the Proposed Action on Military and National Security (including search and rescue)

3.17.2.9.1 Construction and Installation

Offshore Activities and Facilities

Anchoring and new cable emplacement/maintenance: Anchoring and mooring activities would occur during offshore wind energy development within the analysis area as part of the Proposed Action. This would involve increased vessel traffic which could impact military and national security uses by increasing the number of vessels within the analysis area. The presence of construction vessels could cause military vessels to change course or otherwise alter operations and could increase demand for SAR. These impacts are expected to be limited to cable emplacement corridors. Cable laying vessels are expected to travel slowly, typically at speeds of less than 1 knot, resulting in a low risk of collision with other vessels. In addition, it is anticipated that the USCG would establish temporary 500-yard navigation safety zones around each WTG foundation and each cable laying vessel, further reducing risk of contact with other vessels. Therefore, the effects of anchoring and new cable emplacement and maintenance under the Proposed Action on military and national security would be **negligible** adverse**.**

Aviation and aircraft traffic: Construction and installation of the Proposed Action would result in a 7% increase in general aviation in the GAA. Please refer to Section 3.17.2.2.1 for analysis of the Project's construction and installation impacts. The effects of this IPF on military and national security under the Proposed Action would be **minor** adverse, as there would be increased air traffic that could increase navigational complexities for military aircraft in the GAA.

Light: The Proposed Action would result in an increase in temporary construction aviation warning lighting on WTGs offshore. All existing stationary structures would have navigation marking and lighting in accordance with FAA, USCG, and BOEM guidance to minimize allision risks. Implementation of navigational lighting and marking per FAA and BOEM requirements and guidelines would further reduce the risk of military aircraft collisions. This would result in a general increase of lights in the analysis area, which could have **minor** adverse impacts on military and national security by increasing the amount of light in the geographical analysis area.

Presence of structures: Access by military vessels to the RWF and RWEC would be limited during installation; however, USCG air- and waterborne SAR activities would still occur as needed. The addition of up to 100 WTGs, two OSSs, and two RWECs would increase the risk of allisions for military vessels for up to 35 years during Project operations, particularly in bad weather or low visibility. Military vessel traffic within the RI/MA WEA has historically been relatively low (four vessels recorded in 2016 and 2017), and deep-draft military vessels are not anticipated to navigate outside navigation channels unless necessary for SAR operations (BOEM 2021). Additionally, construction of the Proposed Action could attract recreational fishing or sightseeing vessels, which would add to the number of vessels operating in the area to complete construction of these Project elements. The presence of construction-related vessels and additional recreational vessels would add to conflict or collision risks for military and national security vessels and could increase demand for SAR operations. *The Areas Offshore of Massachusetts and Rhode Island Port Access Route Study* (USCG 2020) examined potential navigation SAR issues associated with anticipated offshore wind development in the RI/MA WEA. The USCG report concluded that a wind turbine array that follows a standard and uniform grid pattern with three lines of orientation and standard spaces, as proposed for the Project, would maintain the Coast Guard's ability to conduct SAR operations within the Lease Area (USCG 2020). BOEM (2020) acknowledges, however, that some SAR operations are aided by land-based radar vessel tracking, as well as wind and current tracking to extrapolate disabled vessel distance and direction, which can be inhibited by the presence of WTGs, and suggests mitigation related to radar equipment and event-based operational changes to counteract these effects. The navigational safety risk assessment found there are an average of 1.5 missions expected per year in the Lease Area (DNV GL Energy USA 2020). Therefore, it is anticipated that the presence of Project-related structures would impact some future USCG SAR missions. The presence of offshore wind infrastructure could require adjusting the operational parameters for such missions; however, the impact is anticipated to be minimal based on the uniform spacing of structures for waterborne SAR and other vessel maneuverability and mitigation for land-based radar.

Construction of the Proposed Action would necessitate use of stationary lift vessels within the RWEC, cranes in ports during construction, and FAA-regulated structures temporarily in transit routes between port and the WEA, increasing navigational complexity and changing navigational patterns for vessels and aircraft operating in the area around the WEA during construction and operations. Increased navigational complexity would increase the risk of collisions and allisions for military and national security vessels or aircraft within the WEA, and could increase demand for SAR. Structures would be marked as a navigational hazard per FAA, BOEM, and USCG requirements, and risk would be consistent within the 35-year operational period. It is anticipated that the USCG would establish temporary 500-yard (457-meter) navigation safety zones around each WTG foundation and each installation vessel, reducing risk of contact with other vessels The Project's 1 × 1–nm spacing reduces some of the risk of collisions and allisions. Based on the above impacts, the Project would have **minor** to **moderate** adverse impacts on military operations, including SAR, and national security due to the presence of structures.

<u>Vessel traffic:</u> There would be increased construction and operational vessel traffic from the Proposed Action. This could impact military and national security uses by increasing the number of vessels in the analysis area. The RWF's proposed 1 × 1–nm spacing would result in sufficient space between foundations for vessels to navigate. USCG establishment of temporary safety zones around cable laying vessels and foundation construction sites would further minimize the potential for construction vessel conflicts with military vessels. As a result, the effects of vessel traffic on military and national security uses under the Proposed Action would be **minor** adverse**.**

3.17.2.9.2 Operations and Maintenance and Decommissioning

Offshore Activities and Facilities

<u>Anchoring and new cable emplacement/maintenance:</u> Anchoring and mooring activities would occur during offshore wind energy O&M and decommissioning within the analysis area as part of the Proposed Action. This would involve increased vessel traffic which could impact military and national security uses by increasing the number of vessels within the analysis area. However, the impacts are expected to be small and infrequent during O&M and decommissioning of offshore Project elements. Therefore, the effects of anchoring and new cable emplacement/maintenance under the Proposed Action on military and national security would be **negligible** adverse.

<u>Aviation and aircraft traffic:</u> O&M of the Proposed Action would result in a 0.01% increase in annual general aviation traffic in the GAA. Please refer to Section 3.17.2.2.2 for analysis of the Project's O&M impacts. The increase in vessel traffic associated with Project O&M could result in an increased demand for SAR, and increased military aircraft traffic in and around the RWF. Therefore, the effects of this IPF on military and national security activities under the Proposed Action, including SAR, would be **negligible** adverse.

<u>Light:</u> The O&M and decommissioning of the Proposed Action would result in an increase in permanent lighting on WTGs offshore until decommissioning is complete. All existing stationary structures would have navigation marking and lighting in accordance with FAA, USCG, and BOEM guidance to minimize collision risks. This would result in a general increase of lights in the analysis area, which could have a small impact on military and national security. The addition of permanent lighting would be an ongoing impact; therefore, the effects of light on military and national security under the Proposed Action would be **minor** adverse.

Presence of structures: The addition of up to 100 WTGs and up to two RWECs would increase risk of allisions for military vessels for up to 35 years during Project operations, particularly in bad weather or low visibility. Military traffic within the RI/MA WEA has historically been relatively low (four vessels recorded in 2016 and 2017), and deep-draft military vessels are not anticipated to navigate outside navigation channels unless necessary for SAR operations (BOEM 2021). Additionally, the Proposed Action could create an artificial reef effect until decommissioning is complete, attracting species of interest to recreational fishing or sightseeing, and attracting additional recreational fishing and sightseeing vessels that would be additive to existing vessel traffic in the area. The presence of additional recreational vessels would add to conflict or collision risks for military and national security vessels and could increase demand for SAR operations. Therefore, the Project would have **minor** adverse impacts on military operations and national security.

Vessel traffic: There would be increased operational vessel traffic from the Proposed Action. This could impact military and national security uses by increasing the number of vessels in the analysis area. The RWF's proposed 1 × 1–nm spacing would result in more space for vessels to navigate and would help reduce conflicts with military vessels. As a result, the effects of vessel traffic on military and national security uses under the Proposed Action would be **minor** adverse**.**

3.17.2.9.3 Cumulative Impacts

Offshore Activities and Facilities

Anchoring and new cable emplacement/maintenance: Up to 25,019 acres could be affected by anchoring and mooring activities and cable installation during offshore wind energy development within the analysis area as part of the Proposed Action and other reasonably foreseeable future actions. This offshore energy facility construction of new cable emplacement and maintenance of cables would involve increased vessel traffic, which could impact military and national security uses by increasing the number of vessels within the analysis area. Increased vessel traffic due to anchoring and cable maintenance of wind facilities could lead to course changes of military vessels, thereby increasing navigational complexity and risk of collisions. However, these impacts are expected to be limited to cable emplacement corridors, which would result in contact with cable emplacement and maintenance vessels expected from the Proposed Action and future offshore wind activities. Therefore, the cumulative effects of anchoring and new cable emplacement and maintenance would be **minor** adverse on military and national security.

Aviation and aircraft traffic: The Proposed Action would result in a measurable increase in general aviation traffic in the GAA during construction and installation, as well as decommissioning, which is expected to be similar in aviation traffic volumes as during construction and installation. The Proposed Action would result in a negligible effect on aviation traffic during O&M of the RWF. Other planned and potential future offshore wind projects could also result in increased air traffic due to the use of helicopters and other aircraft during construction and installation, O&M, and decommissioning. While the aviation requirements of other reasonably foreseeable offshore wind activities are unknown, it is anticipated that the aviation requirements for construction and O&M of these projects would be similar to those for the Proposed Action. Construction of these projects may occur concurrently between now and 2030 and, with a conservative 7% increase in aircraft traffic for all aircraft types in the GAA, the cumulative increase in air traffic during the construction period would be additive. Once projects are operational, cumulative O&M air traffic would likely result in a 0.1% increase in aviation traffic for all aircraft. The Proposed Action and reasonably foreseeable future wind projects would be required to engage the FAA in flight planning to avoid impacts to civilian, commercial, government, and military aviation operations. Therefore, the Proposed Action when combined with past, present, and other reasonably foreseeable project impacts would result in **minor** adverse impacts on military and national security.

Light: The Proposed Action would result in an increase in permanent aviation warning lighting on WTGs offshore. All existing stationary structures would have navigation marking and lighting in accordance with FAA, USCG, and BOEM guidance to minimize collision risks and optimize aviation safety. This would result in a general increase of lighting in the GAA, adding to vessel, navigation, onshore housing, and port lighting, which could impact military and national security uses. The Project, in combination with other reasonably foreseeable future actions, could result in the addition of up to 1,117 lighted structures in the analysis area. Therefore, because Project activities combined with reasonably foreseeable activities would result in an increase in lighted structures offshore, the cumulative impacts of light on military and national security would be **minor** adverse.

Presence of structures and vessel traffic: The Proposed Action would require approximately 970 construction vessel trips per construction day over the 2-year construction period. This vessel activity would increase the risk of collisions, allisions, and spills. However, the Proposed Action represents approximately 2% of typical vessel traffic in the GAA. Therefore, the Proposed Action would result in **negligible** adverse impacts to military and national security uses.

BOEM estimates a peak of 262 vessels due to offshore wind project construction over a 10-year time frame. Although the number of construction vessels would represent a large portion of the traffic in the region, most vessels would remain in the maximum work area, with fewer vessels transporting materials back and forth from ports. With multiple offshore wind projects under construction, traffic would also be spread among multiple ports to ensure that sufficient capacity exists at each port and in each waterway. Additionally, BOEM also anticipates that coordination with military and national security interests would be ongoing during construction and installation, O&M, and decommissioning activity.

The Proposed Action would result in noticeable impacts to military and national security through the installation and operation of up to 100 WTGs and two OSSs, along with stationary lift vessels and cranes during construction, to conditions under the No Action Alternative, for a total of 1,117 structures within the GAA. The Proposed Action structures represents a 10% increase over total estimated WTG and OSS foundations across the GAA under the No Action Alternative.

Project structures are likely to generate artificial reef effects that lead to increased abundance of commercially and recreationally desirable fish and shellfish within wind farm boundaries. This could in turn lead to an increase in commercial and recreational vessel traffic and activity in and around wind farms. Increased vessel traffic and presence of structures would therefore contribute to an increase the short-term and long-term collision and allision risks for military and national security vessels, as well as search and rescue vessels. However, deep-draft military vessels are not anticipated to transit outside navigation channels unless needed for search and rescue. Potential allision risks if these vessels lost power would be minimized through the Proposed Action's 1 ×1–nm WTG spacing. BOEM also anticipates that coordination with military and national security interests would be ongoing during construction and installation, O&M, and decommissioning.

Changing navigation patterns could also concentrate vessels within and around the outsides of the RI and MA Lease Areas, potentially causing space use conflicts in these areas or reducing the effectiveness of SAR operations. While the addition of Project structures and associated construction vessels would also increase navigational complexity or alter navigation patterns for military and national security aircraft operating in the region, Project structures would be marked as a navigational hazard per FAA, BOEM, and USCG guidelines and WTGs would be visible on military and national security vessel and aircraft radar. The Proposed Action would implement a 1 × 1–nm spacing, consistent with all other projects in the RI/MA WEA.

Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would consist predominately of impacts described under the No Action Alternative, which would be **moderate** adverse for presence of structures and **minor** adverse for vessel traffic on military and national security.

3.17.2.9.4 Conclusions

Project construction and installation, O&M, and decommissioning would affect ongoing military uses in the analysis area. Similar impacts from Project O&M would occur, although at a lesser extent and duration for some uses. BOEM anticipates that the impacts resulting from the Proposed Action alone that range from interference with ongoing military and national security activities to an expected increase in demand for SAR would range from negligible to moderate adverse. Therefore, BOEM expects the overall impact on military and national security from the Proposed Action alone to be **minor** adverse.

In the context of other reasonably foreseeable environmental trends and planned actions, the impacts under the Proposed Action resulting from individual IPFs would range from **negligible** adverse to **moderate** adverse. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be **moderate** adverse for military uses.

3.17.2.10 Alternative B: Impacts of the Proposed Action on Scientific Research and Surveys (see section in main EIS)

3.17.2.11 Alternative B: Impacts of the Proposed Action on Undersea Cables

3.17.2.11.1 Construction and Installation

Offshore Activities and Facilities

<u>Presence of structures:</u> Up to 100 WTGs, two OSS foundations, and two RWECs would be installed as part of the Proposed Action. The RWEC would cross up to seven identified subsea assets within the installation corridor, including three telecommunications cables.

The presence of the Project could preclude future submarine cable placement in the RWF and RWEC, although there are no future cables identified for location within this area. The presence of the RWF would likely require routing of future undersea cables around the Lease Area. Cable crossings of the RWEC would necessarily include mapping and installation of cable protection at the crossing location, standard design techniques for undersea cable installation. The impacts from foundation construction would be **minor** adverse while the installation of the RWECs would be **negligible** adverse. The overall impact from presence of structures on undersea cables would be **minor** adverse.

Vessel traffic: Increased vessel traffic due to construction and installation of the Proposed Action could interfere with vessels used to install or maintain existing and future undersea cables. Increased construction vessel traffic due to Project construction could lead to course changes of vessels used for undersea cable maintenance and installation and increased traffic along vessel transit routes. Additionally, there would be increased risk for allisions with vessels used for construction of undersea cables. These effects during the construction and installation phase are expected to be minimal and short term. Therefore, the effects of vessel traffic on undersea cables under the Proposed Action would be **negligible** adverse.

3.17.2.11.2 Operations and Maintenance and Decommissioning

Offshore Activities and Facilities

Presence of structures: Up to 100 WTGs, two OSS foundations and two RWECs would be installed as part of the Proposed Action. The presence of the Project could preclude future submarine cable placement. O&M of the Project would be less likely to interfere with future undersea cable development than construction and decommissioning. OSS and WTG foundations would have a larger footprint compared to the RWECs, which are buried, and therefore would be more likely to preclude future undersea cable development. Once the foundations are constructed, impacts from foundation O&M and decommissioning would be **minor** adverse and O&M and decommissioning of RWECs would be **negligible** adverse. The overall impact from presence of structures on undersea cables is **minor** adverse.

Vessel traffic: Increased vessel traffic due to O&M and decommissioning of the Proposed Action could interfere with vessels used to install or maintain existing and future undersea cables. Additionally, there is increased risk for allisions with vessels used for undersea cable O&M. However, given the infrequency of required maintenance at any given location along a cable route, this risk is expected to be low. These effects during the construction and installation phase are expected to be minimal and short in duration. Therefore, the effects of vessel traffic on undersea cables under the Proposed Action would be **negligible** adverse.

3.17.2.11.3 Cumulative Impacts

Offshore Activities and Facilities

Presence of structures: The Proposed Action would result in long-term impacts to existing undersea cables through the installation of up to 100 WTGs and two OSSs to conditions under the No Action Alternative. BOEM estimates a cumulative total of up to 1,117 offshore WTGs and OSS foundations for the Proposed Action plus all other future offshore wind projects in the RI/MA WEA.

Construction of the foundations associated with the Proposed Action and reasonably foreseeable future actions could increase the complexity of undersea cable development by requiring routing around the facilities. Export cables are unlikely to preclude future undersea cable development because cable crossings can be protected using standard design techniques. Therefore, in context of reasonably foreseeable environmental trends, the overall impacts from the presence of structures resulting from the Proposed Action and planned actions are anticipated to be localized long term **negligible** because impacts can be avoided by routing design and standard cable protection techniques.

<u>Vessel traffic:</u> Vessel traffic related to construction and O&M of undersea cables is expected to increase if new undersea cables are constructed and as ongoing maintenance is required. Additionally, there would be increased vessel traffic due to the Proposed Action and reasonably foreseeable future actions. The risk of allision to cable maintenance vessels could increase as more offshore wind energy projects are constructed. However, given the infrequency of required maintenance at any given location along a cable route, this risk is expected to be low. Therefore, the cumulative impact from vessel traffic on undersea cables is **negligible** adverse.

3.17.2.11.4 Conclusions

Project construction and installation, O&M, and decommissioning would affect undersea cables occurring in the GAA. Similar impacts from Project O&M would occur, although at a lesser extent and duration for some uses. BOEM anticipates the impacts resulting from the Proposed Action alone would be **negligible**. Therefore, BOEM expects the overall impact on other marine uses from the Proposed Action alone to be **negligible** adverse for undersea cables.

In the context of other reasonably foreseeable environmental trends and planned actions, the impacts under the Proposed Action resulting from individual IPFs would be **negligible**. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be **negligible** adverse impacts for undersea cables.

3.17.2.12 Alternatives C, D, E, and F: Aviation and Air Traffic

Table 3.17-1 provides a summary of IPF findings by alternative.

3.17.2.12.1 Conclusions

Although Alternatives C through F would reduce the number of WTGs and their associated inter-array cables, which would have an associated reduction in associated vessel and equipment use and air emissions, BOEM expects that the impacts resulting from each alternative alone would be **negligible** adverse compared to the Proposed Action. The overall impacts of Alternatives C through F when combined with past, present, and reasonably foreseeable activities would therefore be the same as under the Proposed Action: **minor** adverse impacts for aviation and air traffic.

3.17.2.13 Alternatives C D, E, and F: Land-Based Radar

Table 3.17-1 provides a summary of IPF findings by alternative.

3.17.2.13.1 Conclusions

Although Alternatives C through F would reduce the number of WTGs and their associated inter-array cables, which would have an associated reduction in associated vessel and equipment use and air emissions, BOEM expects that the impacts resulting from each alternative alone would be the same as the Proposed Action: **minor** adverse. The overall impacts of Alternatives C through F when combined with past, present, and reasonably foreseeable activities would therefore be the same as under the Proposed Action: **moderate** adverse impacts for land-based radar.

3.17.2.14 Alternatives C, D, E, and F: Military and National Security (including Search and Rescue)

Table 3.17-1 provides a summary of IPF findings by alternative.

3.17.2.14.1 Conclusions

Although Alternatives C through F would reduce the number of WTGs and their associated inter-array cables, which would have an associated reduction in associated vessel and equipment use and air emissions, BOEM expects that the impacts resulting from each alternative alone would be similar to the Proposed Action: **minor** adverse. The overall impacts of Alternatives C through F when combined with past, present, and reasonably foreseeable activities would therefore be the same as under the Proposed Action: **moderate** adverse for military uses and national security.

3.17.2.15 Alternatives C, D, E, and F: Scientific Research and Surveys (see section in main EIS)

3.17.2.16 Alternatives C, D, E, and F: Undersea Cables

Table 3.17-1 provides a summary of IPF findings by alternative.

3.17.2.16.1 Conclusions

Although Alternatives C through F would reduce the number of WTGs and their associated inter-array cables, which would have an associated reduction in associated vessel and equipment use and air emissions, BOEM expects that the impacts resulting from each alternative alone would be the same as the Proposed Action: **negligible** adverse. The overall impacts of Alternatives C through F when combined with past, present, and reasonably foreseeable activities would therefore be the same as under the Proposed Action: **negligible** adverse for undersea cables.

3.17.2.17 Alternative G: Impacts of the Preferred Alternative on Aviation and Air Traffic

Table 3.17-1 provides a summary of IPF findings for this alternative.

3.17.2.17.1 Conclusions

Project construction and installation, O&M, and decommissioning under Alternative G would affect ongoing aviation and air traffic occurring in the analysis area through the same mechanisms described for the Proposed Action, including increased air traffic, vessel traffic, vehicle traffic, light, port utilization, and an increase in structures. Although the overall extent of impacts to aviation and air traffic would be reduced under Alternative G relative to the Proposed Action, the significance of those effects would be the same. Therefore, the impacts of Alternative G alone on aviation and air traffic would be **negligible** adverse.

In the context of other reasonably foreseeable environmental trends and planned actions, Alternative G impacts from individual IPFs range from **negligible** to **minor** adverse. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with Alternative G when combined with past, present, and reasonably foreseeable activities would be **minor** adverse impacts for aviation and air traffic.

3.17.2.18 Alternative G: Impacts of the Preferred Alternative on Land-Based Radar

Table 3.17-1 provides a summary of IPF findings for this alternative.

3.17.2.18.1 Conclusions

Construction and installation, O&M, and decommissioning under Alternative G would affect land-based radar in the analysis area. BOEM anticipates the impacts on land-based radar resulting from Alternative G alone would be **minor** adverse because the overall effect would be managed through event-based operational changes and radar equipment upgrades. Considering all the IPFs together, BOEM anticipates that the overall cumulative impacts associated with Alternative G when combined with past, present, and reasonably foreseeable activities would be **moderate** adverse for land-based radar.

3.17.2.19 Alternative G: Impacts of the Preferred Alternative on Military and National Security (including Search and Rescue)

Table 3.17-1 provides a summary of IPF findings for this alternative.

3.17.2.19.1 Conclusions

Project construction and installation, O&M, and decommissioning under Alternative G would affect ongoing military uses in the analysis area. Similar impacts from Project O&M would occur, although at a lesser extent and duration for some uses. BOEM anticipates that the impacts resulting from Alternative G alone that range from interference with ongoing military and national security activities to an expected increase in demand for SAR would range from **negligible** to **moderate** adverse. Therefore, BOEM expects the overall impact on military and national security from Alternative G alone to be **minor** adverse.

In the context of other reasonably foreseeable environmental trends and planned actions, the impacts under Alternative G resulting from individual IPFs would range from **negligible** adverse to **moderate** adverse. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with Alternative G when combined with past, present, and reasonably foreseeable activities would be **moderate** adverse for military and national security.

3.17.2.20 Alternative G: Impacts of the Preferred Alternative on Scientific Research and Surveys (see section in main EIS)

3.17.2.21 Alternative G: Impacts of the Preferred Alternative on Undersea Cables

Table 3.17-1 provides a summary of IPF findings for this alternative.

3.17.2.21.1 Conclusions

Project construction and installation, O&M, and decommissioning would affect undersea cables in the GAA. Similar impacts from Project O&M would occur, although at a lesser extent and duration for some uses. BOEM anticipates the impacts resulting from Alternative G alone would be **negligible**. Therefore, BOEM expects the overall impact on other marine uses from Alternative G alone to be **negligible** adverse for undersea cables.

In the context of other reasonably foreseeable environmental trends and planned actions, the impacts of Alternative G resulting from individual IPFs would be **negligible**. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with Alternative G when combined with past, present, and reasonably foreseeable activities would be **negligible** adverse impacts for undersea cables.

3.17.2.22 Mitigation

Mitigation measures resulting from agency consultations for land-based radar and military and national security are identified in Appendix F, Table F-2, and summarized in Table 3.17-2. These measures, if adopted, would further define how the effectiveness and enforcement of EPMs would be ensured and would improve accountability for compliance with EPMs by requiring the submittal of plans for approval by the enforcing agency(ies) and by defining reporting requirements. Because these measures ensure the effectiveness of and compliance with EPMs that are already analyzed as part of the Proposed Action, implementation of these measures would not further reduce the impact level of the Proposed Action from what is described in Section 3.17.2. Aviation, air traffic, and undersea cables have no additional mitigation measures proposed.

Table 3.17-2. Mitigation and Monitoring Measures Resulting from Consultations for Other Marine Uses (land-based radar and military and national security) (Appendix F, Table F-2)

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
Land-based Radar		
Operational mitigation for ARSR-4 and ASR-8/9 radar	Mitigation for ASR-8/9 radar: Passive aircraft tracking using ADS-B or signal/transponder Increasing 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 inhibit, velocity editing, plot amplitude thresholding (limiting the amplitude of certain signals) Modification mitigations for ARSR-4 and ASR-8/9 systems include using the dual beams of the radar simultaneously and using in-fill radar. Additional conditions for COP approval to mitigate potential impacts on ASR-8/9 include notifying the North American Aerospace Defense Command 30 to 60 days ahead of Project completion and when the Project is complete and operational for Radar Adverse-impact Management (RAM) scheduling, contributing funds toward execution of the RAM, and curtailment of operations for national security or defense purposes.	These measures would reduce the anticipated minor adverse impacts to air defense and homeland security radar systems.
Mitigation for oceanographic HF radar	WTG operators sharing real-time surface current telemetry, other oceanographic data, and wind turbine operational data with radar operators would serve to aid interference mitigation.	These measures would complement existing EPMs and further reduce anticipated negligible impacts to weather radar and minor adverse impacts on SAR activities.

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	Mitigation would also include a wind farm curtailment agreement. Additional modifications identified for oceanographic HF radar systems include signal processing enhancements and antenna modifications.	
Mitigation for NEXRAD weather radar systems	Research is underway for potential to mitigate weather radar using phased array radars to achieve a null in the antenna radiation pattern in the direction of the wind turbine. Additional mitigation includes a wind farm curtailment agreement.	This measure would further reduce anticipated negligible impacts on weather radar systems.
Military and National Security		
Fiber-optic sensing technology	Distributed fiber-optic sensing technology proposed for the Project or associated transmission cables would be reviewed by the DOD to ensure that distributed fiber-optic sensing technology is not used to detect sensitive data from DOD activities, to conduct any other type of surveillance of U.S. government operations, or to otherwise pose a threat to national security.	Although this measure would not reduce the minor to moderate adverse impacts to military operations and national security, it would prevent the potential for impacts resulting from the use of wind energy project structures for surveillance.
WTG shut-down mechanism	Equip all WTG rotors (blade assemblies) with control mechanisms operable from the Project control centers 24 hours a day, 7 days a week. The control mechanisms would enable control room operators to shut down the requested WTGs within an agreed-upon time of notification between the USCG and Revolution Wind. A formal shut-down procedure would be part of the standard operating procedures and periodically tested. Normally, USCG-ordered shut downs would be limited to those WTGs in the immediate vicinity of an emergency and for as short	This measure would reduce anticipated minor impacts by allowing the USCG to request shut down of WTGs as necessary to complete military and national security operations, maintain public safety, and conduct SAR.

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	a period as is safely practicable under the circumstances, as determined by the USCG.	
WTG shut-down mechanism	Revolution Wind would participate in periodic USCG-coordinated training and exercises to test and refine notification and shut-down procedures and to provide SAR training opportunities for USCG vessels and aircraft.	This measure would reduce anticipated minor impacts by providing smooth WTG shut-down procedures through training and increased coordination.
WTG shut-down mechanism	Prior to operation of the Project, Revolution Wind would submit a written plan for O&M, which includes control center (or centers), for review by BOEM and the USCG. The plan must demonstrate that the control centers would be adequately staffed to perform standard operating procedures, communications capabilities, and monitoring capabilities. The plan would include the following topics that may be modified through ongoing discussions with the USCG: Standard operating procedures: Methods for establishing and testing WTG rotor shut down; methods of lighting control; methods for notifying the USCG of mariners in distress or potential/actual SAR incidents; methods for notifying the USCG of any events or incidents that may impact maritime safety or security; and methods for providing the USCG with environmental data, imagery, communications, and other information pertinent to SAR or marine pollution response. Staffing: Number of personnel intended to staff the control centers to ensure continuous monitoring of WTG operations, communications, and surveillance systems.	This measure would reduce anticipated minor impacts by providing a plan to support testing, training, and implementation of WTG shut down in emergency situations. The plan would also provide communication protocols for providing information on WTG operations and incidents that could affect military and national security uses.

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	Communications: Capabilities to be maintained by the control centers to communicate with the USCG and mariners in and near the Lease Area. Communications capability would, at a minimum, include VHF marine radio and landline and wireless for voice and data. Monitoring: The control centers would maintain the capability to monitor the Project installation and operations in real time (including night and periods of poor visibility) for determining the status of all PATONs and for detecting a survivor who has climbed to the survivor's platform, if installed, on any WTG or OSS.	
WTG shut-down mechanism	If the Project's OSSs include helicopter-landing platforms, those platforms would be designed and built to accommodate up to and including USCG H60 sized rescue helicopters.	This measure would reduce anticipated minor impacts by allowing military and national security uses to use wind energy structures during operations and for emergencies.

3.17.2.22.1 Measures Incorporated into the Preferred Alternative

Mitigation measures for other marine uses required through completed consultations, authorizations, and permits listed in Table 3.15-14 and in Appendix F, Table F-2, are incorporated into Alternative G (Preferred Alternative). BOEM has identified additional measures in Table 3.15-15 as incorporated into the Preferred Alternative. These measures, if adopted, would further define how the effectiveness and enforcement of EPMs would be ensured and would improve accountability for compliance with EPMs by requiring the submittal of plans for approval by the enforcing agency(ies) and by defining reporting requirements. Because these measures would ensure the effectiveness of and compliance with EPMs that are already analyzed as part of the Proposed Action, implementation of these measures would not further reduce the impact level of the Proposed Action from what is described in Section 3.17.2.

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3.18 Recreation and Tourism

3.18.1 Description of the Affected Environment and Environmental Consequences of the No Action Alternative for Recreation and Tourism

Geographic analysis area: The GAA for recreation and tourism (Figure 3.18-1) comprises all Project components plus a 40-mile radius around the Lease Area. The area covers approximately 6,113 square miles of open ocean, 1,488 square miles of land, and over 1,008 miles of shoreline, and coincides with the Project's visual impact assessment (EDR 2023) to 1) address Project visibility from visually sensitive resources located within New York, Connecticut, Rhode Island, and Massachusetts and 2) encompass all locations where BOEM anticipates recreation impacts associated with Project construction and installation, O&M, and decommissioning.

Affected environment: Recreation and tourism play a major role in the leisure pursuits of local residents and the coastal economies of the states affected by the Project (see Section 3.9 and Section 3.11). NOAA collects economic data for six sectors dependent on the ocean and Great Lakes: living resources, marine construction, marine transportation, offshore mineral resources, ship and boat building, and tourism and recreation. Tourism and recreation statistics from NOAA's Economics: National Ocean Watch are good indicators of coastal and ocean tourism because they estimate the ocean-dependent portion of business for hotels and restaurants by including only those establishments located in shore-adjacent zip code areas, and they exclude all forms of sports and entertainment that are not ocean-related. A summary of economic data for counties and states that fall within the recreation and tourism analysis area is aggregated in Table 3.18-1. As of 2018, ocean economy sectors accounted for 3% to 22% of the total economy for affected counties and states. Tourism and recreation were the substantive sources of economic activity for most locations.

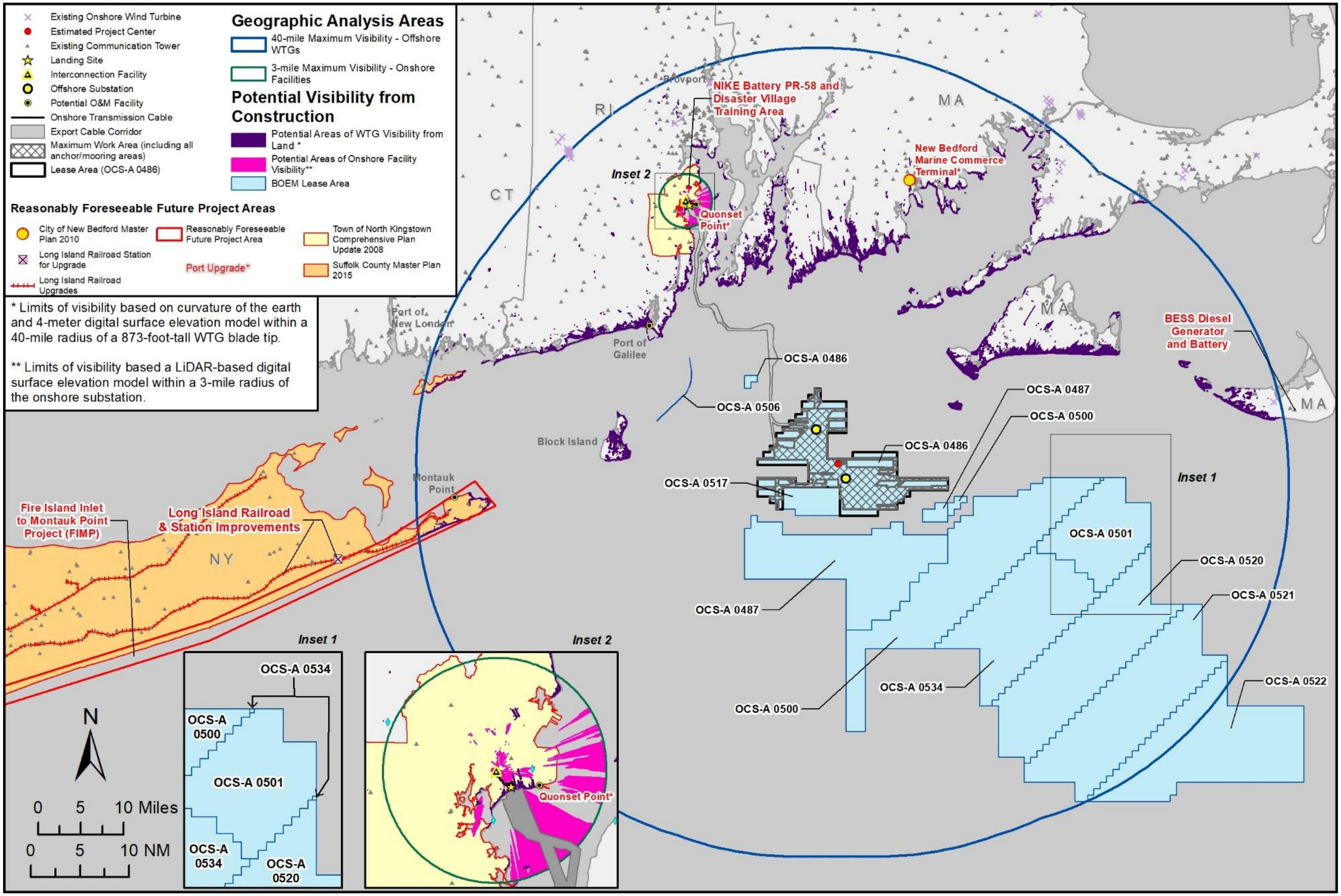

Figure 3.18-1. Geographic analysis area for recreation and tourism.

Table 3.18-1. Ocean Economies for Counties and States that Would be Directly or Indirectly Affected by the Project

Location	% of Total Economy	Number of Employed Residents for Tourism and Recreation (% of total residents employed in ocean economy)	Total Wages for Tourism and Recreation (% of total wages generated by ocean economy)	Total Gross Domestic Product for Tourism and Recreation (% of total gross domestic product generated by ocean economy)
Suffolk County, NY	6%	36,385 (87.9%)	921.1 million (70.1%)	1.9 billion (73.4%)
New London, CT	17%	7,397 (36.2%)	176.5 million (12.9%)	374.3 million (15.5%)
Washington, RI	21%	6,032 (53.5%)	145.2 million (31.6%)	327.6 million (27.6%)
Kent, RI	10%	7,338 (96.4%)	148.5 million (91.7%)	321.8 million (93.0%)
Providence, RI	6%	14,803 (92.1%)	326.3 million (84.8%)	700.0 million (87.9%)
Bristol, RI	17%	1,977 (86.8%)	46.5 million (76.8%)	96.1 million (72.6%)
Bristol, MA	3%	2,963 (48.9%)	55.0 million (19.1%)	105.8 million (16%)
Newport, RI	21%	6,976 (82.0%)	184.4 million (54.2%)	444.1 million (56.8%)
Plymouth, MA	5%	9,180 (87.5%)	203.8 million (71.2%)	400.9 million (71.3%)
Barnstable, MA	19%	17,028 (94.0%)	489.3 million (87.9%)	1.1 billion (87.0%)
Dukes, MA	16%	1,394 (97.5%)	52.9 million (96.1%)	120.1 million (96.9%)
Nantucket, MA	22%	1,668 (99.5%)	71.2 million (99.7%)	159.7 million (99.8%)

Source: NOAA (2020).

Notes: CT = Connecticut, MA = Massachusetts, NY = New York, RI = Rhode Island.

The analysis area for recreation and tourism supports a wide range of inland, shoreline or beach, and ocean-based recreation and tourist activities, including 16 water trails, more than 1,000 conservation areas, nearly 1,000 hiking trails, New Bedford Whaling National Historical Park, several hundred designated SCUBA diving areas, and 78 marinas (Northeast Ocean Data 2021). Recreational activities include beach-going, boating (for pleasure and competition), walking-hiking, swimming, surfing, metal detecting, horseback riding, camping, stand-up paddleboarding, cross-country skiing, kite sailing, and scenic-bird-nature viewing. The *Ocean State Outdoors Rhode Island's Comprehensive Outdoor Recreation Plan* (Rhode Island DEM 2019) identifies visiting coastal areas-beaches as one of the top three outdoor activities by Rhode Island residents. Likewise, Connecticut's statewide survey identifies beach activities as the top water-related recreation activity by residents (Center for Public Policy & Social Research 2017). Road or trail biking, birdwatching, and camping are also activities reported as displaying a relatively high degree of participation. Based on a broader study encompassing the northeast United States, the five most popular activities in the northeast region are beachgoing (61.9%), scenic enjoyment-sightseeing (50.2%), watching marine life (33.7%), photography (32.5%), and collecting non-living resources-beachcombing (27.4%) (Bloeser et al. 2015). The same study notes that surfing, stand-up paddleboarding, and triathlon typically occurred in nearshore bay-protected waters.

Locally, Blue Beach, a public beach, is approximately 500 feet west of the southwest corner of the Project's proposed 20-acre landfall envelope. Blue Beach is accessed via a trail located west of the Hayward Industries, Inc. building, which is just outside the landfall envelope. Compass Rose Beach, another public beach, is approximately 2,600 feet east of the southeast corner of the landfall envelope. The Martha's Vineyard Fast Ferry dock is directly east of Compass Rose Beach. The North Kingstown Golf Course is approximately 2,000 feet north of the northern edge of the landfall envelope and is separated by Roger Williams Way.

Boating in the analysis area includes ocean-going vessels down to small boats used by residents and tourists in sheltered waters. A 2012 survey of recreational boaters along the northeastern U.S. coast found that more than half (52.4%) of recreational boating occurred within 1 nm of the coastline (Starbuck and Lipsky 2013). In 2011, NOAA estimated that 93% of the 2011 recreational boating from Massachusetts occurred within 3 nm of shore (BOEM 2012). However, several long-distance sailboat races may pass through the offshore portions of analysis area, depending on the route selected for a particular year; these races include the Transatlantic Race, Marion to Bermuda Race, and Newport to Bermuda Race. Although these sailing events occur along the entire Long Island coastline, they are generally small (averaging less than 50 racing vessels). Larger sightseeing boats also travel to offshore locations where sightings of whales are more likely.

Recreational fishing along the shoreline and the pursuit of highly migratory species (HMS) such as tuna, shark, swordfish, and billfish are also popular recreational activities in the analysis area. In the nearby Vineyard Wind Lease Area, the recreational fishing effort for HMS occurs seasonally from June to October using a wide range of fishing methods, although mobile fishing methods predominate (Kneebone and Capizzano 2020). Coxes Ledge, The Fingers, and The Claw all support the highest level of recreational fishing for HMS (see Section 3.9 for additional discussion of recreational fishing activities and trends).

Although many of the above-listed publicly available recreation and tourism activities are free, local businesses also offer boat rentals and numerous recreation experiences such as private boat-cruise charters; canoe, kayak, and stand-up-paddleboard touring; whale watching; deep-sea fishing charters; and scuba diving in the analysis area. These tourism activities also support other local businesses, including non-ocean-related leisure, hotels, and restaurants.

Recreation and tourism in the GAA are noticeably higher in the spring, summer, and fall when the ambient air and water temperatures are comfortable (Parsons and Firestone 2018).

Historically, much of the fishing by the region's Native American tribes was concentrated in the nearshore marine and estuarine environment (Bennett 1955). Recent BOEM consultation with Native American tribes in lease areas adjacent to the Project indicate that tribal subsistence fisheries continue to occur predominately in inshore areas (BOEM 2020).

3.18.2 Environmental Consequences

3.18.2.1 Relevant Design Parameters, Impact-Producing Factors, and Potential Variances in Impacts

This assessment analyzes the maximum-case scenario; however, there is the potential for variances in the proposed Project build-out, as defined in the PDE (see Appendix D). The Project design parameters that would influence the magnitude of the impacts on recreation and tourism consists of the number and type of WTGs installed. Impacts on recreational fishing and boating are based on the installation of 100 WTGs and two OSSs, for a total of 102 foundations in the GAA. If Revolution Wind were instead to install 59 12-MW WTGs, the maximum height of the blade tip for WTGs would be 873 feet above the surface, compared to 648 feet for the 8-MW WTGs. Because the WTGs would exceed 699 feet, FAA regulations require supplemental mid-tower lighting, in addition to lighting at the top of the nacelle (FAA 2018). The taller WTGs and additional lighting would result in greater visual impacts within the GAA. However, the 12-MW WTG option would reduce the number of WTGs and IAC; therefore, navigational complexity for offshore recreation users would be reduced compared to the 8-MW WTG option.

Revolution Wind has committed to implementing ADLS (as described in Appendix F) as a measure to reduce the duration of lighting impacts. Revolution Wind would also establish temporary safety zones around construction areas and work with the USCG to communicate these zones and other work areas to the boating public via local Notices to Mariners. These EPMs would be implemented across all alternatives; therefore, BOEM would not expect measurable potential variances in impacts across the alternatives.

See Appendix E1 for a summary of IPFs analyzed for recreation and tourism across all action alternatives. IPFs that are either not applicable to the resource or determined by BOEM to have a negligible adverse effect are excluded from Chapter 3 and provided in Appendix E1 Table E2-10.

Table 3.18-2 provides a summary of IPF findings carried forward for analysis in this section. Each alternative analysis discussion consists of the construction and installation phase, the O&M phase, the decommissioning phase, and the cumulative analysis. If these analyses are not substantially different, then they are presented as one discussion.

A detailed analysis of the Proposed Action is provided following the table. Detailed analysis of other considered action alternatives is also provided below the table if analysis indicates that the alternative(s) would result in substantially different impacts than the Proposed Action. Offshore and onshore IPFs are addressed separately in the analysis if appropriate for the resource; not all IPFs have both an offshore and onshore component. Where feasible, calculations for specific alternative impacts are provided in Appendix E4, to facilitate reader comparison across alternatives.

The Conclusion section within each alternative analysis discussion includes rationale for the effects determinations. All of the action alternatives would include both adverse and beneficial effects. Overall, these effects to recreation and tourism across all alternatives would be **minor** adverse because they would be small, and the resource would be expected to recover completely with no mitigating action required.

Table 3.18-2. Alternative Comparison Summary for Recreation and Tourism

<table>
<tr><th>Impact-Producing Factor</th><th>No Action Alternative</th><th>Alternative B (Proposed Action)
up to 100 WTG</th><th>Alternative C
(Habitat Alternative)
64–65 WTGs</th><th>Alternative D
(Transit Alternative)
78–93 WTGs</th><th>Alternative E
(Viewshed Alternative)
64–81 WTGs</th><th>Alternative F
(Higher Capacity Turbine Alternative)
56 WTGs</th><th>Alternative G
(Preferred Alternative)</th></tr>
<tr><td rowspan="2">Anchoring and new cable emplacement/ maintenance</td><td>Offshore: Most anchoring would occur outside the area most commonly used for recreational boating, which would prevent most conflicts for recreational uses. Anchoring activities would also be temporary and localized; therefore, construction-related anchoring impacts from future projects would be minor adverse.
Smaller vessel anchors would not penetrate to the typical target cable burial depth (4 to 6 feet), and recreational vessel anchoring is uncommon in water depths where offshore structures would be installed. However, scour protection for cables and foundations could hinder boat anchoring and result in gear entanglement or loss if recreational activity coincides with scour protection areas. If project-related seafloor hazards are not noted on charts, operators could lose anchors, leading to increased risks associated with drifting vessels that are not securely anchored. Therefore, new cable emplacement and maintenance would result in temporary to long-term minor adverse impacts.</td><td>Offshore: Installation of offshore cables and anchoring would temporarily restrict recreation access within the cable routes. Revolution Wind would implement a comprehensive communication plan during offshore construction to inform all mariners, including commercial and recreational fishermen and recreational boaters, of construction activities and vessel movements. Temporary safety zones around each WTG site and each cable-laying vessel (anticipated to be established and monitored by Revolution Wind) would minimize potential conflicts for recreational uses. Potential O&M anchoring impacts would be similar to the construction phase, but reduced due to fewer anchored vessels. Therefore, potential changes in navigation routes due to Proposed Action would constitute a temporary, minor adverse impact.
Cable installation could also affect fish and mammals of interest for recreational fishing and sightseeing through dredging and turbulence, although no population-level impacts are expected, resulting in short-term minor adverse impacts.
Up to approximately 6,550 acres of anchoring and 18,995 acres of cabling seafloor disturbance could occur from ongoing and planned actions, including the Proposed Action, in the recreation and tourism GAA. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in short-term and long-term minor adverse cumulative impacts on recreation and tourism.</td><td colspan="4">Offshore: Alternatives C through F would reduce the number of WTG foundations and scour protection associated with the IAC. This could reduce risks associated with gear entanglement or loss if recreational activity occurs in scour protection areas. Reduced IAC installation could also negligibly decrease turbidity that could alter the behavior of species important to recreational fishing (see Section 3.9) and marine mammal sightseeing. Differences in estimated acres of anchoring by alternative are disclosed in Appendix E4 and range from 1,814 acres (Alternative F) to 2,961 acres (Alternative D). Project design for IACs and the export cable has not occurred for Alternatives C through F; therefore, a comparison of cabling-related disturbance is not available. However, best professional judgment suggests that the footprint of the IAC, OSS-link cable, and RWEC would change and be slightly reduced to match the reduced number of WTGs.
During O&M, no impacts are anticipated because the RWEC, IAC, and OSS transmission cable typically have no maintenance requirements unless a fault or failure occurs.
Approximately 5,158 to 6,331 acres of anchoring and up to 18,995 acres of cabling seafloor disturbance could occur from ongoing and planned actions, including Alternatives C through F (see Appendix E4 for a comparison of cumulative anchoring acreage estimates). Project-related construction anchorages would noticeably add to disturbances of marine species and their habitats important to recreational fishing and could require recreational and tourism vessels to navigate around moving and anchored construction-related vessels while in transit. The buried cabling would also present short-term navigational hazards. Therefore, Alternatives C through F when combined with past, present, and reasonably foreseeable activities would result in short-term and long-term minor adverse cumulative impacts on recreation and tourism.</td><td>Offshore: Alternative G would reduce the number of WTG foundations and scour protection associated with the IAC. This could reduce risks associated with gear entanglement or loss if recreational activity occurs in scour protection areas. Reduced IAC installation could also negligibly decrease turbidity that could alter the behavior of species important to recreational fishing (see Section 3.9) and marine mammal sightseeing. Differences in estimated acres of anchoring by alternative are disclosed in Appendix E4 and would be 2,098 acres for Alternative G. A comparison of cabling-related disturbance is not available. However, best professional judgment suggests that the footprint of the IAC, OSS-link cable, and RWEC would change and be slightly reduced to match the reduced number of WTGs.
During O&M, no impacts are anticipated because the RWEC, IAC, and OSS transmission cable typically have no maintenance requirements unless a fault or failure occurs.
Approximately 5,444 acres of anchoring and 18,386 acres of cabling seafloor disturbance could occur from ongoing and planned actions, including Alternative G (see Appendix E4 for a comparison of cumulative anchoring acreage estimates). Project-related construction anchorages would noticeably add to disturbances of marine species and their habitats important to recreational fishing and could require recreational and tourism vessels to navigate around moving and anchored construction-related vessels while in transit. The buried cabling would also present short-term navigational hazards. Therefore, Alternative G when combined with past, present, and reasonably foreseeable activities would result in short-term and long-term minor adverse cumulative impacts on recreation and tourism.</td></tr>
<tr><td>Onshore: Onshore construction and installation of future wind facilities could affect recreation and tourism due to noise and activity at the landfall locations or</td><td>Onshore: Installation of onshore cables would be localized. No direct impacts to public parks, beaches, or other public recreational facilities would occur. Therefore, recreation and tourism</td><td colspan="4">Onshore: Alternatives C through F would not impact onshore activities; therefore, impacts would be the same as those described for the Proposed Action: negligible adverse.</td><td>Onshore: Alternative G would not impact onshore activities; therefore, impacts would be</td></tr>
</table>

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative)
	along the onshore cable route if these locations intersect recreational or commercial uses. These **minor** adverse impacts would be unavoidable during construction but would be temporary and localized.	impacts during construction would be temporary and **minor** adverse. No onshore cable maintenance would be required unless a fault or failure occurs. Therefore, cumulative, O&M, and decommissioning impacts would represent a **negligible** adverse impact on recreational users.					the same as the Proposed Action: **negligible** adverse.
Light	**Offshore:** Visual impacts on recreation and tourism would be short term during construction and long term during O&M, with **negligible to moderate** adverse impacts, based on the observed distance and individual responses by recreationists and visitors to changes in the viewshed.	**Offshore:** Visual impact assessment prepared for Revolution Wind (see COP Appendix U3 [EDR 2023]) determined that the Project would not likely be easily detectable when viewed from a distance of 20 miles or more and that only 3% of the land area within the visual study area would contain views of the Project. Therefore, visual impacts on recreation and tourism would be temporary during construction, with **negligible** to **moderate** adverse impacts, based on the observed distance. The Proposed Action's aviation warning lighting, when visible, would add a developed/industrial visual element to views that were previously characterized by dark, open ocean during O&M. Due to the limited duration and frequency of such events and the distance of WTGs from shore, however, visible aviation hazard lighting for the Proposed Action would result in a long-term intermittent **negligible** adverse impact on recreation and tourism. Given the distance from recreational viewers and atmospheric interference, lighting from the Proposed Action, when combined with past, present, and reasonably foreseeable projects, would result in long-term intermittent **minor** adverse cumulative impacts on recreation and tourism.	**Offshore:** Construction of offshore components would likely require less time under Alternatives C through F than under the Proposed Action, and could lead to reduced potential lighting impacts due to a smaller number of installed WTGs, ranging from 56 WTGs (Alternative F) to 93 WTGs (Alternative D). Therefore, Alternatives C through F would have **negligible** to **moderate** adverse impacts. Alternatives C through F would also reduce nighttime O&M lighting as compared to the Proposed Action due to the required aviation hazard lighting of fewer WTGs and the addition of two OSSs. Because of the limited duration and frequency of such events and the distance of WTGs from shore, however, visible aviation hazard lighting would still only result in a long-term negligible adverse impact on recreation and tourism. Offshore construction activities would add new WTGs and two OSSs to the No Action Alternative. Construction vessels would employ navigational safety lighting, and offshore structures would employ aviation and navigation hazard lighting. New lighting from Alternatives C through F would contribute a 6% to 10% increase to in-water lighting sources from past, present, and reasonably foreseeable future projects within the GAA by introducing built visual elements to views previously characterized by dark, open ocean. Given that impacts would depend on observed viewer distance and atmospheric interference, lighting from Alternatives C through F when combined with past, present, and reasonably foreseeable projects would result in long-term intermittent **minor** adverse cumulative impacts on recreation and tourism.				**Offshore:** Construction of offshore components would likely require less time under Alternative G than under Proposed Action, and could lead to reduced potential lighting impacts due to a smaller number of installed WTGs as compared to the maximum-case scenario for the Proposed Action. Therefore, Alternative G would have **negligible** to **moderate** adverse impacts. Alternative G would also reduce nighttime O&M lighting as compared to the Proposed Action due to the required aviation hazard lighting of fewer WTGs and the addition of two OSSs. Because of the limited duration and frequency of such events and the distance of WTGs from shore, however, visible aviation hazard lighting would still only result in a long-term negligible adverse impact on recreation and tourism. Offshore construction activities would add new WTGs and two OSSs to the No Action Alternative. Construction vessels would employ navigational safety lighting, and offshore structures would employ aviation and navigation hazard lighting. New lighting from Alternative G would contribute a 7% increase to in-water lighting sources from past, present, and reasonably foreseeable future projects within the GAA by introducing built visual elements to views previously characterized by dark, open ocean. Given the distance from recreational viewers and atmospheric interference, lighting from Alternative G when combined with past, present, and reasonably foreseeable projects would result in long-term intermittent **minor** adverse cumulative impacts on recreation and tourism.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative)
	Onshore: Construction of some planned future onshore projects would require new visible structures or nighttime lighting on structures that could be visible by onshore recreational users and tourists. Onshore O&M impacts from future projects would be variable based on project type) but are anticipated to be long term with variable **minor** to **moderate** adverse impacts experienced based on the observed distance.	**Onshore**: Light from onshore construction activities could temporarily adversely impact the recreation experience of users if present or traveling on roads near the landing site, onshore cable route, and proposed onshore facilities. However, as previously noted, no public parks, beaches, or other public recreational facilities are within or immediately adjacent to this onshore route, OnSS, or ICF. For nighttime construction work, downward-facing portable floodlights would be used in compliance with all safety and security and local government requirements. Therefore, for most locals and tourists, any adverse impacts would be temporary, **minor**, and inconvenient but would not cause a loss to their overall experience. Operational lighting for the OnSS and ICF would comply with Quonset Development Corporation lighting regulations and be mounted with the lamp horizontal to the ground (light facing straight down) or with a lamp tilt no more than 25 degrees from the horizon. As such, it is anticipated that the OnSS and ICF would result in long-term **negligible** adverse lighting impacts to the recreation and tourism activities in the GAA. Construction associated with the Proposed Action could add temporary **minor** adverse light impacts experienced by onshore recreational users near the landfall work area, onshore transmission cable route, or onshore facilities or from the aviation hazard lighting on the new WTGs. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in temporary **minor** adverse cumulative impacts to onshore recreation and tourism.	**Onshore:** Alternatives C through F would not impact onshore activities; therefore, impacts would be the same as those described for the Proposed Action: **negligible** to **minor** and temporary to long term.				**Onshore:** Alternative G would not impact onshore activities; therefore, impacts would be the same as the Proposed Action: **negligible** to **minor** and temporary to long term.
Noise	**Offshore**: Pile driving is the loudest aspect of most planned future projects. Most pile driving would occur far enough offshore that that work would be inaudible from onshore locations or from typical recreational fishing locations (within 1 mile of the coast). However, pile driving and other construction noise could cause some offshore boaters and recreational fishers to avoid areas of noise-generating activity, although the loudest noise would	**Offshore**: Construction noise could result in impacts on recreation and tourism through displacement of species important to recreational fishing and sightseeing in and around construction areas, resulting in a short-term **moderate** adverse impact to fishing, shellfishing, or whale-watching activities. Offshore construction and onshore cable installation near the landfall area at Quonset Point in North Kingstown, Rhode Island, could have short-term **negligible** to **minor** adverse	**Offshore**: Alternatives C through F would negligibly decrease noise associated with pile driving for WTGs as compared to the Proposed Action, resulting in short-term **moderate** adverse impacts. Operational noise sources and levels would also be similar to, but slightly lower than, the Proposed Action, resulting in long-term **minor** adverse impacts. Construction activities would add noise from pile driving for foundations proposed under Alternatives C through F and from offshore dredging for the export and inter-array cabling to the ambient noise levels of the No Action Alternative. Noise from construction could lead to the displacement of fish in and around construction sites, leading to spatial competition, depending on migrating patterns. Recreational boaters and tourists would not be permitted to approach active construction zones and would therefore not be expected to experience noise impacts from offshore construction. Because of the distance from receptors,				**Offshore**: Alternative G would negligibly decrease noise associated with pile driving for WTGs as compared to the Proposed Action, resulting in short-term **moderate** adverse impacts. Operational noise sources and levels would also be similar to, but slightly lower than, the Proposed Action, resulting in long-term **minor** adverse impacts. Construction activities would add noise from pile driving for foundations and from offshore dredging for the export and inter-array cabling

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative)
	be within the temporary safety zones (with restricted recreational and tourism vessel access) anticipated to be established for each project by offshore wind developers. Most of the anticipated offshore O&M noise from future projects would be from continuous WTG operations farther offshore. Field observations also concluded that WTG operational noise from the Block Island Wind Farm was not detectable from shore and further suggested that as wind speeds increase (causing increased ambient noise), the associated increase in operational noise of the WTG becomes less detectable (HDR 2019). Therefore, noise from offshore activities would result in temporary to long-term **minor** adverse impacts.	impacts on the recreational enjoyment of the marine and coastal environments. Offshore operational noise from the WTGs would be similar to the noise described for other projects under the No Action Alternative and would thus have long-term **minor** adverse impacts. Because of the distance from receptors, the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in localized short-term **minor** to **moderate** adverse cumulative impacts on recreation and tourism due to construction activities, whereas noise from O&M activities would result in long-term **negligible** adverse cumulative impacts.	Alternatives C through F when combined with past, present, and reasonably foreseeable activities would result in localized, short-term **minor** to **moderate** adverse cumulative impacts on recreation and tourism due to construction activities, whereas noise from O&M activities would result in long-term **negligible** cumulative impacts.				to the ambient noise levels of the No Action Alternative. Noise from construction could lead to the displacement of fish in and around construction sites, leading to spatial competition, depending on migrating patterns. Recreational boaters and tourists would not be permitted to approach active construction zones and would therefore not be expected to experience noise impacts from offshore construction. Because of the distance from receptors, Alternative G when combined with past, present, and reasonably foreseeable activities would result in localized, short-term **minor** to **moderate** adverse cumulative impacts on recreation and tourism due to construction activities, whereas noise from O&M activities would result in long-term **negligible** cumulative impacts.
	Onshore: Construction noise from planned future projects onshore would be variable based on project type, but many projects would include one or more noise-generating activities such as earth moving, pile driving, trenching, jackhammering, and other similar large equipment operations. Onshore O&M impacts from future projects would be variable based on project type but are anticipated to be adverse and long term with variable **minor** to **moderate** adverse impacts experienced based on the distance to the noise source.	**Onshore**: Noise from onshore construction activities could temporarily adversely impact the recreation experience of users if present or traveling on roads near the landing site, onshore cable route, and proposed onshore facilities. However, as previously noted, no public parks, beaches, or other public recreational facilities are within or immediately adjacent to this onshore route, OnSS, or ICF. Therefore, for most locals and tourists, any adverse impacts would be temporary**,** **minor**, and inconvenient but would not cause a loss to their overall experience. Operations of onshore Project components (i.e., offshore to onshore transition joint bays, onshore transmission cable route, OnSS, and ICF) would have **negligible** adverse noise impacts intermittently over the life of the Project to onshore recreation and tourism because these components would only require periodic routine maintenance. As with lighting, construction activities would add noise from the construction of onshore facilities to the ambient noise levels of the No Action Alternative. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in temporary	**Onshore**: Alternatives C through F would not impact onshore activities; therefore, impacts would be the same as those described for the Proposed Action: **negligible** to **minor** and temporary to long term.				**Onshore**: Alternative G would not impact onshore activities; therefore, impacts would be the same as the Proposed Action: **negligible** to **minor** and temporary to long term.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative)
		minor adverse cumulative impacts to onshore recreation and tourism.					
Presence of structures	**Offshore**: Recreational impacts associated with in-water structures would include the risk of recreational vessel allision and collision, fishing gear entanglement, vessel damage or loss, increased navigation hazards, and visual impacts: The impact of visible structures on recreation would be long term and **moderate** adverse but unlikely to impact shore-based or marine recreation and tourism in the GAA as a whole.	**Offshore**: Offshore structures would impact recreation and tourism through increased navigational complexity, risk of allision or collision, attraction of recreational vessels to offshore wind structures for fishing and sightseeing, increased risk of fishing gear loss or damage by entanglement due to scour or cable protection, and potential difficulties in anchoring over scour or cable protection. Revolution Wind would minimize these **minor** to **moderate** adverse impacts through the navigation- and fishing-related EPMs listed in Appendix F. Based on the duration of Project activity and observed distance, visual contrast associated with the Proposed Action could have a beneficial, adverse, or neutral impact on the quality of the recreation and tourism experience depending on the viewer's orientation, activity, and purpose for visiting the area. Additionally, construction of offshore Project components could elicit a long-term **minor** beneficial impact through an increase in curiosity, recreational fishing and diving activity. New structures related to the Proposed Action would noticeably increase navigational complexity; risks of structure allision; route adjustments for races, sightseeing, and fishing; loss and damage of fishing gear to scour and cable protection; viewshed changes; and difficulty anchoring over scour and cable protection. However, new in-water structures from the Proposed Action could benefit recreation and tourism by attracting recreational vessels to WTGs for fishing and sightseeing activities. Therefore, new in-water structures from the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in short-term and long-term **minor** to **moderate** adverse and long-term **minor** beneficial cumulative impacts on recreation and tourism.	**Offshore**: Alternatives C through F would reduce the number of WTGs, ranging from 56 WTGs (Alternative F) to 93 WTGs (Alternative D), potentially allowing for improved maneuverability for recreational vessels through the Lease Area. These alternatives could also negligibly reduce visual impacts as compared to the Proposed Action, depending on the observable distance and individual responses to a view of offshore wind farms (see Section 3.20 for details). Alternatives C through F would add foundations to the 893 foundations estimated for the No Action Alternative within the GAA. New structures would add to the long-term impacts on recreation and tourism throughout the life of the Project (up to 35 years, plus up to an additional 2 years for decommissioning) by increasing navigational complexity; risks of structure allision; route adjustments for races, sightseeing, and fishing; loss and damage of fishing gear to scour and cable protection; and difficulty anchoring over scour and cable protection. Based on visual simulations from onshore locations, some seaside locations could experience reduced recreational and tourism activity as a result of visible in-water structures, but the visibility of large offshore structures is not expected to impact shore-based recreation and tourism as a whole. New in-water structures could also benefit recreation and tourism by attracting recreational vessels to WTGs for fishing and sightseeing activities. Therefore, new in-water structures from Alternatives C to F when combined with past, present, and reasonably foreseeable activities would result in short-term and long-term **minor** to **moderate** adverse and long-term **minor** beneficial cumulative impacts on recreation and tourism.				**Offshore**: Alternative G would reduce the number of WTGs as compared to the maximum-case scenario for the Proposed Action, potentially allowing for improved maneuverability for recreational vessels through the Lease Area. This alternative could also negligibly reduce visual impacts as compared to the Proposed Action, depending on the observable distance and individual responses to a view of offshore wind farms (see Section 3.20 for details). Alternative G would add foundations to the 893 foundations estimated for the No Action Alternative within the GAA. New structures would add to the long-term impacts on recreation and tourism throughout the life of the Project (up to 35 years, plus up to an additional 2 years for decommissioning) by increasing navigational complexity; risks of structure allision; route adjustments for races, sightseeing, and fishing; loss and damage of fishing gear to scour and cable protection; and difficulty anchoring over scour and cable protection. Based on visual simulations from onshore locations, some seaside locations could experience reduced recreational and tourism activity as a result of visible in-water structures, but the visibility of large offshore structures is not expected to impact shore-based recreation and tourism as a whole. New in-water structures could also benefit recreation and tourism by attracting recreational vessels to WTGs for fishing and sightseeing activities. Therefore, new in-water structures from Alternative G when combined with past, present, and reasonably foreseeable activities would result in short-term and long-term **minor** to **moderate** adverse and long-term **minor** beneficial cumulative impacts on recreation and tourism.
	Onshore: Not applicable	**Onshore**: Inland residential/commercial areas and recreational sites would generally be screened from construction views due to the presence of existing development combined with forested	**Onshore:** Alternatives C through F would not impact onshore activities; therefore, impacts would be the same as those described for the Proposed Action: **negligible** to **minor** adverse and temporary to long term.				**Onshore:** Alternative G would not impact onshore activities; therefore, impacts would be the same as the Proposed Action: **negligible** to **minor** adverse and temporary to long term.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative)
		areas (see COP Appendix U1 [EDR 2023]). Therefore, any adverse impacts to overall recreator experience would be temporary and **minor** adverse impacts, but would not cause a loss to the overall recreator experience. The proposed OnSS and ICF would not be out of scale or character with the existing types of development currently present in the vicinity, such as the existing Davisville Substation or the structures at nearby Quonset Business Park. As such, it is anticipated that O&M of the OnSS and ICF would result in **negligible** adverse visual impacts to recreation and tourism activities in the GAA. New onshore structures would only result in **minor** adverse visual impacts experienced by recreational users due to the existing settings at these locations. When considered cumulatively with past, present, and reasonably foreseeable activities, the Proposed Action would result in temporary **negligible** to **minor** adverse cumulative visual impacts on recreation and tourism.					
Vessel traffic	**Offshore**: Future projects would generate increased nearshore and offshore vessel traffic, primarily during construction, along routes between ports and the offshore wind construction areas. Although long-term increased traffic volumes from O&M of future projects would be low, they would add to existing in-water vessel traffic and therefore present **minor** long-term adverse impacts on recreational users.	**Offshore**: Construction would result in as many as 59 construction vessels per construction day in 2023 and 2024 present at offshore work areas on a daily basis. However, the majority of recreational boating occurs within 1 nm of shore. Therefore, most recreational boaters in the GAA would experience a temporary **minor** adverse inconvenience from construction-related vessel traffic. The estimated low volume of O&M vessel traffic would not be anticipated to affect ongoing recreational use. O&M of the Proposed Action would therefore have **negligible** adverse impacts on onshore or offshore recreation and tourism. Project vessels would add to disturbances of marine species and their habitats important to recreational fishing and could require recreational and tourism vessels to navigate around moving construction-related vessels while in transit. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in short-term and long-term **minor** adverse cumulative impacts on recreation and tourism.	**Offshore**: Construction of offshore components would likely require less time for Alternatives C through F than anticipated for the Proposed Action, and could lead to reduced potential navigational impacts for recreational users due to a smaller number of WTGs. Therefore, Alternatives C through F would have **negligible** to **minor** adverse impacts.				**Offshore**: Construction of offshore components would likely require less time for Alternative G than anticipated for the Proposed Action, and could lead to reduced potential navigational impacts for recreational users due to a smaller number of WTGs. Therefore, Alternative G would have **negligible** to **minor** adverse impacts.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative D (Transit Alternative) 78–93 WTGs	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative)
	Onshore: Future projects could increase onshore vehicle traffic or alter traffic patterns in a manner that inconveniences recreational users, primarily during construction near port facilities and on adjacent, existing roadways. Although long-term increased traffic volumes from O&M activities of future projects would be relatively low, they would add to the existing onshore traffic and therefore present **minor**, localized long-term adverse impacts on recreational users.	**Onshore**: No public parks, beaches, or other public recreational facilities are immediately adjacent to the onshore route, OnSS, or ICF. Additionally, Revolution Wind would coordinate with local authorities during onshore construction to minimize local traffic impacts. Therefore, any adverse impacts to tourism or overall recreator experience would be temporary to long term and **minor** adverse.	**Onshore**: Alternatives C through F would not impact onshore activities; therefore, impacts would be the same as those described for the Proposed Action: **minor** and temporary to long term.				**Onshore**: Alternative G would not impact onshore activities; therefore, impacts would be the same as the Proposed Action: **minor** and temporary to long term.

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3.18.2.2 Alternative A: Impacts of the No Action Alternative on Recreation and Tourism

3.18.2.2.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for recreation and tourism (see Section 3.18.1) would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities and by permitted and constructed offshore wind COP projects within the GAA. These IPFs are described and analyzed in Appendix E1.

3.18.2.2.2 Cumulative Impacts

This section discloses potential recreation and tourism impacts associated with future offshore wind development (without the Proposed Action). The cumulative impact analysis for the No Action Alternative for planned non-offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E1.

Offshore Activities and Facilities

<u>Anchoring and new cable emplacement/maintenance:</u> Construction of future projects would increase the number of anchored vessels and work platforms used for survey and construction purposes. Applying estimates developed by BOEM based on their 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), up to 3,346 acres of anchoring could occur under the No Action Alternative in the recreation and tourism GAA. The presence of anchored vessels could increase navigation complexity for recreational vessels. Increased turbidity from anchoring could also briefly alter the behavior of species important to recreational fishing (see Section 3.9) and sightseeing (primarily whales, but also dolphins and seals). However, most anchored construction-related vessels would be located within temporary safety zones (anticipated to be established and monitored by offshore wind developers). Likewise, most anchoring would occur outside the area most commonly used for recreational boating, which would prevent most conflicts for recreational uses. Anchoring activities would also be temporary and localized; therefore, construction-related anchoring impacts from future projects would be **minor** adverse. Anchoring impacts to fish species used for recreational fishing are addressed in Section 3.9.

Up to 14,986 acres of seafloor disturbance could occur from IAC and export cable installation within the recreation and tourism GAA (see Appendix E4, Table E4-1). As with anchoring, installation of offshore cables would temporarily increase navigation complexity for recreational vessels present around work areas and reduce recreational opportunities if individuals prefer to avoid the noise and disruption caused by installation. Cable installation could also have temporary impacts on individual fish and invertebrates of interest for recreational fishing due to dredging, turbulence, and disturbance; however, no population-level species impacts would occur. Once installed, buried cables typically have no maintenance unless a fault or failure occurs. Smaller vessel anchors would not penetrate to the typical target cable burial depth (4 to 6 feet), and recreational vessel anchoring is uncommon in water depths where offshore structures would be installed. However, scour protection for cables and foundations could hinder boat anchoring and result in gear entanglement or loss if recreational activity coincides with scour protection areas. If project-related seafloor hazards are not noted on charts, operators could lose anchors, leading to increased risks associated with drifting vessels that are not securely anchored. Therefore, new cable emplacement and maintenance would result in temporary to long-term **minor** adverse impacts.

Light: Construction of future planned offshore projects would require nighttime lighting on WTGs, vessels, and platforms that could be visible by onshore recreational users and tourists, as well as offshore boaters recreating at night or in low-light conditions. O&M of the estimated 876 WTGs in the GAA would require permanent aviation warning lights that could be visible from some beaches and coastlines and could impact recreation and tourism if recreation decisions are influenced by lighting. Field observations made from the mainland shoreline during WTG operations at the Block Island Wind Farm indicated that at nighttime and under clear skies, the turbine lights were visible with the naked eye up to 26.75 miles (23.2 nm) (HDR 2019). A University of Delaware study evaluating the impacts of visible offshore WTGs on beach use found that WTGs visible more than 15 miles from the viewer would have negligible adverse impacts on businesses dependent on recreation and tourism (Parsons and Firestone 2018). Likewise, a 2017 study on the impact of offshore wind facilities on vacation rental prices found that nighttime views of aviation hazard lighting (without ADLS) for WTGs close to shore (5 to 8 miles) would adversely impact the rental price of properties with ocean views (Lutzeyer et al. 2017). However, the study did not specifically address the relationship between lighting, nighttime views, and tourism for WTGs located farther from shore.

A 2013 BOEM study evaluated the impacts of WTG lighting on birds, bats, marine mammals, sea turtles, and fish. The study found that existing guidelines “appear to provide for the marking and lighting of [WTGs] that would pose minimal if any impacts on birds, bats, marine mammals, sea turtles or fish” (Orr et al. 2013). By extension, existing lighting guidelines or ADLS (if implemented) would not impact recreational fishing or wildlife viewing opportunities.

Lighting impacts would be most pronounced for views that can be currently characterized as undeveloped, where lighting from human infrastructure and activities is not dominant or even exists. However, less than 5% of the lighted WTG positions envisioned in the GAA would be within 15 miles from coastal locations. Therefore, visual impacts on recreation and tourism would be short term during construction and long term during O&M, with **negligible** to **moderate** adverse impacts, based on the observed distance and individual responses by recreationists and visitors to changes in the viewshed.

Noise: Construction noise from offshore activities from planned future projects such as pile driving, trenching, and construction-related vessels would intrude upon the natural sounds of the marine environment. Pile driving is the loudest aspect of most planned future projects. Most pile driving would occur far enough offshore that that work would be inaudible from onshore locations or from typical recreational fishing locations (within 1 mile of the coast). However, pile driving and other construction noise could cause some offshore boaters and recreational fishers to avoid areas of noise-generating activity, although the loudest noise would be within the temporary safety zones (with restricted recreational and tourism vessel access) anticipated to be established for each project by offshore wind developers. Additionally, because some fish species are sensitive to underwater sound, construction noise could cause fish to move away from the noise source, which could adversely affect recreational fishing opportunities near work areas. Construction noise could also contribute to impacts on marine mammals, with resulting impacts on marine sightseeing that relies on the presence of mammals, primarily whales. However, as noted in Section 3.15, no population-level marine mammal effects are anticipated.

Most of the anticipated offshore O&M noise from future projects would be from continuous WTG operations farther offshore. Sound pressure levels would be at or below ambient levels at relatively short distances from WTG foundations (Kraus et al. 2016). Field observations made during normal operations at the Block Island Wind Farm minimally exceeded ambient levels at 164 feet from the WTG base. These field observations also concluded that WTG operational noise from the Block Island Wind Farm was not detectable from shore and further suggested that as wind speeds increase (causing increased ambient noise), the associated increase in operational noise of the WTG becomes less detectable (HDR 2019). Therefore, noise from offshore activities would result in temporary to long-term **minor** adverse impacts.

<u>Presence of structures:</u> The placement and operation of up to 893 foundations (see Table E4-1 in Appendix E4) are proposed within the recreation and tourism GAA. Recreational impacts associated with in-water structures would include the risk of recreational vessel allision and collision, fishing gear entanglement, vessel damage or loss, increased navigation hazards, and visual impacts.

Offshore routes for recreational boaters, anglers, sailboat races, and sightseeing boats could require adjustment to avoid allision risks with in-water structures. Generally, the vessels more likely to allide with WTGs or OSSs would be smaller vessels capable of moving within and near wind installations. Examples include recreational fishing (especially HMS fishing), long-distance sailboat races, sightseeing boats, and large sailing vessels. Sailing vessels with tall masts that could be affected by in-water structures, like WTGs and associated platforms, could choose to avoid offshore in-water structures. However, the adverse impact of the future offshore wind structures on recreational boating would be limited by the distance offshore. As previously noted, a 2012 survey of recreational boaters along the northeastern United States coast found that the highest density of recreational vessels occurs within 1 nm of the coastline (Starbuck and Lipsky 2013). Likewise, a 2020 study of recreational boaters in the RI/MA WEA found that wind facilities are unlikely to have significant impacts on recreational boaters because those boaters prefer to use waters closer to the coast. Most recreational boaters from Rhode Island ports who choose to visit the RI/MA WEAs would likely keep their distance from new structures, and increased abundance of targeted fish species near offshore wind facilities would have beneficial impacts on recreational fishing (Dalton et al. 2020). Based on these findings, under the No Action Alternative, most recreational vessels would not interact with proposed WTGs and OSS(s). However, WTGs could also attract recreational boaters and sightseeing vessels. These conditions could increase the number of congregating vessels and increase collision or allision risks (see Section 3.16 for additional discussion of navigation impacts). The USCG would need to adjust their search and rescue planning and search patterns to allow aircraft to fly within the GAA, as described in greater detail in Section 3.17.

HMS fisheries are further offshore than most fisheries and therefore more likely to overlap with future offshore wind development. The greatest amount of recreational HMS fishing effort in southern New England from 2002 through 2018 occurred west of the RI/MA WEA (Kneebone and Capizzano 2020), although HMS fishing also occurred in specific locations within the RI/MA WEA, including The Dump, Coxes Ledge, The Fingers, and The Claw (see Section 3.9). Commonly used mobile methods for HMS angling such as trolling and drifting could be incompatible with the presence of WTGs and OSSs, depending upon weather conditions and specific techniques. For example, trolling could involve trailing many feet of lines and hooks behind the vessel and then following large pelagic fish once they are hooked, posing navigational and maneuverability challenges around WTGs. Scour protection used for in-water foundations would also increase risk of recreational fishing gear loss or damage by entanglement and present a hazard for anchoring (see new cable placement above). These concerns notwithstanding, new in-water structures could result in several long-term beneficial impacts including increased recreational fishing by introducing new aquatic habitats (see Section 3.9) and increased tourism by people interested in viewing the structures (see Section 3.18.2.2.2). New in-water structures could also create foraging opportunities for seals, small odontocetes, and sea turtles (see Sections 3.15 and 3.19), which could offer recreational sightseeing opportunities.

Visual impacts from the presence of vertical structures on the offshore horizon would create a visual contrast contrary to the horizontal plane of the ocean's water surface and the line at the visual horizon that separates the ocean from sky. Studies and surveys that have evaluated the impacts of offshore wind facilities on tourism found that established offshore wind facilities in Europe did not result in decreased tourist numbers, tourist experience, or tourist revenue, and that Block Island's WTGs provide excellent sites for fishing and shellfishing (Smythe et al. 2018). The proximity of WTGs to shore may be correlated to recreational experience. As noted in Parsons and Firestone (2018), different changes to beach experience occurred based on distance to visible WTGs. Reported trip loss (respondents who stated that they would visit a different beach without offshore wind) averaged 8% when wind projects were 12.5 miles (20 km) offshore, 6% when 15 miles (24.1 km) offshore, and 5% when 20 miles (32 km) offshore. Conversely, approximately 2.6% of respondents were more likely to visit a beach with visible offshore wind facilities at any distance. A 2019 survey of coastal recreation users in New Hampshire (Ferguson et al. 2020) also found that most users (77%) supported offshore wind development along the New Hampshire coast, 74% anticipated that offshore wind development would have a neutral to beneficial impact on their recreational activities, and 26% anticipated that offshore wind development would have an adverse impact (Ferguson et al. 2021).

Based on the currently available studies, portions of nearly all 876 WTGs associated with the No Action Alternative could be visible from shorelines (depending on vegetation, topography, weather, atmospheric conditions, and the viewers' visual acuity) (see Section 3.20 for details). WTGs visible from some shoreline locations in the GAA would have adverse impacts on visual resources when discernable because of the introduction of industrial elements in previously undeveloped views. Visual impacts would be more pronounced in views lacking development and outside of heavy recreation use times (i.e., when crowds of beachgoers do not impact the visitor's experience of the natural elements of the landscape). Based on the research cited above, the impact of visible structures on recreation would be long term and **moderate** adverse but unlikely to impact shore-based or marine recreation and tourism in the GAA as a whole. Visual impacts to tribes that may be present or travel to the GAA for recreation or tourism purposes are disclosed in Section 3.10.

Vessel traffic: Future projects would generate increased nearshore and offshore vessel traffic, primarily during construction, along routes between ports and the offshore wind construction areas. Applying vessel activity estimates developed by BOEM based on their 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), vessel activity could peak in 2025 with as many as 210 vessels involved in the construction of reasonably foreseeable projects (see Section 3.16.1.1). Increased vessel traffic would require increased alertness on the part of recreational or tourist-related vessels and could result in minor delays or route adjustments, particularly if more than one future offshore wind facility is under construction at the same time. The likelihood of vessel collisions would increase as a result of the higher volumes of vessel traffic during construction. However, most of the moving construction-related vessels would be located within temporary safety zones (anticipated to be established and monitored by offshore wind developers), which would prevent most conflicts for recreational uses. These activities would also be temporary and localized. Although long-term increased traffic volumes from O&M of future projects would be low, they would add to existing in-water vessel traffic and therefore present **minor** long-term adverse impacts on recreational users.

Onshore Activities and Facilities

<u>Anchoring and new cable emplacement/maintenance:</u> No anchoring impacts would occur as a result of future onshore activities. However, onshore construction and installation of future wind facilities could affect recreation and tourism due to noise and activity at the landfall locations or along the onshore cable route if these locations intersect recreational or commercial uses. These **minor** adverse impacts would be unavoidable during construction but would be temporary and localized. No long-term cable impacts are anticipated because cables would be buried.

<u>Light:</u> Construction of some planned future onshore projects would require new visible structures or nighttime lighting on structures that could be visible by onshore recreational users and tourists. However, most onshore project components are anticipated to be in previously developed and lighted areas. Therefore, adverse effects of onshore lighting from construction would be short term and localized to discrete construction sites. Onshore O&M impacts from future projects would be variable based on project type (i.e., increased rail and road infrastructure use, increased port operational noise) but are anticipated to be long term with variable **minor** to **moderate** adverse impacts experienced based on the observed distance.

<u>Noise:</u> Construction noise from planned future projects onshore would be variable based on project type, but many projects would include one or more noise-generating activities such as earth moving, pile driving, trenching, jackhammering, and other similar large equipment operations. Recreational users could be subject to these construction noises anywhere future projects intersect public access areas, public recreational facilities, public roadways, or private and commercial facilities where tourism occurs (e.g., restaurants, shopping, and lodging establishments). Onshore construction noise from cable installation at the landfall locations, and inland if cable routes are near parkland, recreation areas, or other areas of public interest, would temporarily disturb the quiet enjoyment of the site (in locations where such quiet is an expected or typical condition). However, most of these onshore project components are anticipated to be in previously developed areas. Therefore, adverse effects of onshore noise from construction would be short term and localized to discrete construction sites. Onshore O&M impacts from future projects would be variable based on project type (i.e., increased rail and road infrastructure use, increased port operational noise) but are anticipated to be adverse and long term with variable **minor** to **moderate** adverse impacts experienced based on the distance to the noise source.

<u>Vessel traffic:</u> Future projects could increase onshore vehicle traffic or alter traffic patterns in a manner that inconveniences recreational users, primarily during construction near port facilities and on adjacent, existing roadways. Construction vehicles and construction areas would follow established safety guidelines that would prevent most conflicts for recreational uses. Impacts from onshore activities would be temporary and localized; therefore, construction impacts from future projects would not add to adverse impacts on recreational users. Although long-term increased traffic volumes from O&M activities of future projects would be relatively low, they would add to the existing onshore traffic and therefore present **minor**, localized long-term adverse impacts on recreational users.

3.18.2.2.3 Conclusions

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and decommissioning would not occur; and potential impacts on recreation and tourism associated with the Project would not occur. However, ongoing and future activities would have continuing short-term to long-term impacts on recreation and tourism, primarily due to the interruption of access and introduction of new offshore hazards, as well as new aquatic habitat and increased tourism/recreation opportunities.

BOEM anticipates that the range of individual IPF impacts for reasonably foreseeable offshore wind activities would be **negligible** to **moderate** adverse and **minor** beneficial, primarily due to the presence of offshore structures. As described in Appendix E1, BOEM anticipates that the range of individual IPF impacts for ongoing activities and reasonably foreseeable activities other than offshore wind would be **minor** to **moderate** adverse.

Considering all the IPFs together, BOEM anticipates that the overall impact associated with all reasonably foreseeable environmental trends and activities would result in **minor** adverse impacts on recreation and tourism because most adverse impacts could be avoided, would not disrupt normal or routine recreation and tourism functions, or would return to a condition with no measurable effects after activity ends.

3.18.2.3 Alternative B: Impacts of the Proposed Action on Recreation and Tourism

3.18.2.3.1 Construction and Installation

Offshore Activities and Facilities

During construction, recreational offshore uses such as boating, fishing, diving, and wildlife and whale watching could be adversely impacted by Project activities. Detailed analysis by IPF is provided below. Construction EPMs would be implemented to minimize adverse impacts to recreators as practicable (see Table F-1 in Appendix F), including communication with vessel operators and implementation of ADLS.

<u>Anchoring and new cable emplacement/maintenance:</u> Anchoring could occur anywhere within the maximum work area under the Proposed Action, although impacts would be localized to specific anchoring sites and would be temporary in duration. The presence of as many as 59 construction vessels per construction day in 2023 and 2024 would increase navigation complexity for recreational vessels, requiring individual boats to navigate around Project vessels and work areas (see COP Table 3.3.10-2). Increased turbidity from anchoring could also briefly alter the behavior of species important to recreational fishing (see Section 3.9) and marine mammal sightseeing. However, temporary safety zones around each WTG site and each cable-laying vessel (anticipated to be established and monitored by Revolution Wind) would minimize potential conflicts for recreational uses. Anchoring activities would also be localized; therefore, construction impacts would represent a temporary, **minor** adverse impact on recreational users. Proposed Action anchoring impacts to fish species used for recreational fishing are addressed in Section 3.9.

Up to 4,009 acres of seafloor disturbance could occur from Proposed Action IAC and export cable installation within the recreation and tourism GAA. Installation of offshore cables would temporarily restrict recreation access within the cable routes. Recreational vessels traveling near the cable routes would also need to navigate around construction vessels. Revolution Wind would implement a comprehensive communication plan during offshore construction to inform all mariners, including commercial and recreational fishermen and recreational boaters, of construction activities and vessel movements. Communication would be facilitated through a fisheries liaison, a Project website, and public notices to mariners and vessel float plans (in coordination with the USCG). Therefore, potential changes in navigation routes due to Proposed Action construction would constitute a temporary, **minor** adverse impact.

Cable installation could also affect fish and mammals of interest for recreational fishing and sightseeing through dredging and turbulence, although no population-level impacts are expected (see Sections 3.13 and 3.9), resulting in short-term and **minor** adverse impacts on recreation and tourism.

<u>Light:</u> The Proposed Action would require nighttime lighting for construction vessels traveling to and working at the Project's offshore construction areas that could be visible by recreational users and tourists. The visual impact assessment prepared for Revolution Wind (see COP Appendix U3 [EDR 2023]) determined that the Project would not likely be easily detectable when viewed from a distance of 20 miles or more and that only 3% of the land area within the visual study area would contain views of the Project. Therefore, visual Impacts on recreation and tourism would be temporary during construction, with **negligible** to **moderate** adverse impacts, based on individual responses by recreationists and visitors to changes in the viewshed. Popular tourism locations near the Lease Area, such as Aquinnah Overlook, would have the potential for greater adverse impacts than more distant locations (see Section 3.20).

<u>Noise:</u> Construction noise could result in impacts on recreation and tourism through displacement of species important to recreational fishing and sightseeing in and around construction areas, resulting in a short-term **moderate** adverse impact to fishing, shellfishing, or whale-watching activities. Pile driving represents the loudest likely noise source during construction activities. Installation of a single monopile foundation is estimated to normally require 1 to 4 hours (6 to 12 hours maximum) of pile driving; up to three WTG monopile foundations would be installed in a 24-hour period. Therefore, recreational boaters near the RWEC and WTGs could also be temporarily inconvenienced by pile-driving noise.

Offshore construction and onshore cable installation near the landfall area at Quonset Point in North Kingstown, Rhode Island, could have short-term **negligible** to **minor** adverse impacts on the recreational enjoyment of the marine and coastal environments. This landing site is developed for military and industrial use; however, the closest public recreation area, Blue Beach, is located approximately 500 feet to the southwest of the Project's landfall envelope. Compass Rose Beach, another public beach, and Martha's Vineyard Fast Ferry are also located approximately 2,600 feet east of the southeast corner of the landfall envelope. Recreational users at these locations could experience temporary adverse impacts due to construction noise, if these noise levels exceed ambient noise conditions generated by ongoing industrial and port activities.

<u>Presence of structures:</u> The installation of up to 102 Project foundations are proposed within the recreation and tourism GAA. As also noted under the No Action Alternative, these offshore structures would impact recreation and tourism through increased navigational complexity, risk of allision or collision, attraction of recreational vessels to offshore wind structures for fishing and sightseeing, increased risk of fishing gear loss or damage by entanglement due to scour or cable protection, and potential difficulties in anchoring over scour or cable protection. Revolution Wind would minimize these **minor** to **moderate** adverse impacts through the navigation- and fishing-related EPMs listed in Appendix

F. As part of these EPMs, Revolution Wind would establish temporary safety zones around construction areas and work with the USCG to communicate these zones and other work areas to the boating public via local Notices to Mariners. Additionally, the majority of recreational boating would occur more than 10 miles from Proposed Action WTGs and OSSs.

WTG and OSS construction could also affect recreation and tourism through visual impacts. During construction, offshore boaters and visitors on the coastline would see the upper portions of tall equipment such as mobile cranes. This equipment would move from turbine to turbine as construction progresses and thus would not be long-term fixtures.

Further, a survey-based study of 1,725 participants who typically visit the coast suggested that (based on visual simulations for prospective offshore wind facilities) only 10% of respondents would experience adverse visual impacts at a distance of 10 miles from shore (Parsons and Firestone 2018). The study suggests that coastal visitors could experience adverse reactions approaching 0% from Project WTGs at approximately 25 to 30 miles offshore. Based on the duration of construction activity and observed distance, visual contrast associated with the Proposed Action would have a temporary **negligible** adverse impact on recreation and tourism, subject to individual responses by recreationists and visitors to changes in the viewshed. Popular tourism locations near the Lease Area, such as Aquinnah Overlook, would have the potential for greater adverse impacts than more distant locations (see Section 3.20).

Additionally, construction of offshore Project components could elicit a temporary beneficial impact through an increase in curiosity visits by individuals interested in WTG construction (Parsons and Firestone 2018). The PDE analyzed for the Project allows for installing wind turbines that may reach 873 feet to the tip of blade (52% taller than those studied by Parsons and Firestone) with a rotor diameter of 538 feet (9% larger rotor diameter than those studied by Parsons and Firestone). Although it is predictable that the percentage of social acceptance or change in choice may shift, the shift would not be proportional to the difference in the size and scale of the wind turbines in Parsons and Firestone's 2018 study and those analyzed in this EIS.

Vessel traffic: Construction would result in as many as 59 construction vessels per construction day in 2023 and 2024 present at offshore work areas (see COP Table 3.3.10-2) on a daily basis. This increase in vessel volume for the Proposed Action would contribute to increased vessel traffic and associated vessel collision risk along routes between ports and the offshore construction areas if recreational boaters cross or approach cable and WTG locations. However, the majority of recreational boating occurs within 1 nm of shore (Starbuck and Lipsky 2013). Therefore, most recreational boaters in the GAA would experience a temporary, **minor** adverse impact from construction-related vessel traffic.

Onshore Activities and Facilities

Anchoring and new cable emplacement/maintenance: No anchoring impacts would occur as a result of onshore activities. Although onshore construction and installation would occur at the landing site during installation of the cable onshore/offshore transition vaults and during HDD or trenching in preparation for joining the onshore and offshore cables, the landfall work area is developed for non-recreational purposes. The Quonset Point Naval Air Station property is currently the home of the 14^{3r}d Airlift Wing of the Rhode Island Air National Guard and is in use as both a military base and a public airport with two active runways. A portion of the base has been converted into a business park. The onshore cable route would follow Circuit Drive to the OnSS. No public parks, beaches, or other public recreational facilities are within or immediately adjacent to this onshore route. However, the route travels through the Wickford Historic District, which is primarily a residential community with some commercial buildings that support a seasonal recreation economy. Three potential recreation opportunities—the Wickford Village/Harbor State Scenic Area, the Quonset-Martha's Vineyard Ferries, and Narraganset Bay—are also located in the vicinity. Additionally, as noted above, two public beaches—Blue Beach and Compass Rose Beach—are within 500 to 2,600 feet of the landfall envelope. However, installation of onshore cables would be localized. No direct impacts to public parks, beaches, or other public recreational facilities would occur. Therefore, recreation and tourism impacts during construction would be temporary and **minor** adverse.

Light and Noise: Light and noise from onshore construction activities could temporarily adversely impact the recreation experience of users if present or traveling on roads near the landing site, onshore cable route, and proposed onshore facilities. However, as previously noted, no public parks, beaches, or other public recreational facilities are within or immediately adjacent to this onshore route, OnSS, or ICF. Additionally, the onshore construction schedule would be designed to minimize impacts to the local community during the summer tourist season, generally between Memorial Day and Labor Day. The majority of onshore construction would be completed during daytime hours. Revolution Wind would generally comply with North Kingstown's noise ordinance; however, certain construction tasks such as concrete pours, HDD and landfall installation, and cable pulling or splicing, once started, would be continued through to completion. For nighttime construction work, downward-facing portable floodlights with a maximum height of approximately 18 feet would be used in compliance with all safety and security and local government requirements. Therefore, for most locals and tourists, any adverse impacts would be temporary **minor** impacts, but would not cause a loss to their overall experience.

Presence of structures: A new OnSS and ICF adjacent to the existing Davisville Substation would be constructed to support interconnection of the Project to the existing electrical grid. Vegetation clearing and taller equipment (e.g., cranes) would be visible from certain vantage points during construction of these onshore structures. However, inland residential/commercial areas and recreational sites would generally be screened from construction views due to the presence of existing development combined with forested areas (see COP Appendix U1 [EDR 2023]). Therefore, any adverse impacts to overall recreator experience would be temporary and **minor** adverse impacts, but would not cause a loss to the overall recreator experience.

Vessel traffic: Vehicle and equipment traffic from onshore cable construction activities could temporarily adversely impact the recreation experience of users if present or travelling on roads near the landing site and onshore cable route and facilities. However, as previously noted, no public parks, beaches, or other public recreational facilities are immediately adjacent to the onshore route, OnSS, or ICF. Additionally, Revolution Wind would coordinate with local authorities during onshore construction to minimize local traffic impacts. Therefore, any adverse impacts to tourism or overall recreator experience would be temporary and **minor** adverse.

3.18.2.3.2 Operations and Maintenance and Decommissioning

Offshore Activities and Facilities

Anchoring and new cable emplacement/maintenance: During the O&M, a limited number of vessels would be present in the Lease Area or RWEC at any one time. Potential anchoring impacts would be similar to the construction phase, but reduced due to fewer anchored vessels. No cable impacts are anticipated as the RWEC, IAC, and OSS transmission cable typically have no maintenance requirements unless a fault or failure occurs. If cable repair or replacement or remedial cable protection is required, maintenance activities would be limited to the disturbance corridors previously defined for construction. Therefore, O&M and decommissioning impacts would represent a temporary **minor** adverse impact on recreational users. Proposed Action anchoring and cable impacts to fish species used for recreational fishing are addressed in Section 3.9.

Impacts during decommissioning would be similar to the impacts during construction and installation.

Light: During operations, the Proposed Action would contribution to nighttime lighting due to required aviation hazard lighting of up to 102 WTGs and OSSs. The visual impact assessment prepared for Revolution Wind (see COP Appendix U3 [EDR 2023]) determined that the Project would not likely be easily detectable when viewed from a distance of 20 miles or more, and that only 3% of the land area within the visual study area would contain views of the Project. Revolution Wind has also committed to implement ADLS (as described in Appendix F) as a measure to reduce the duration of lighting impacts. As noted in Section 3.20, the Proposed Action’s aviation warning lighting, when visible, would add a developed/industrial visual element to views that were previously characterized by dark, open ocean. Due to the limited duration and frequency of such events and the distance of WTGs from shore, however, visible aviation hazard lighting for the Proposed Action would result in a long-term intermittent **negligible** adverse impact on recreation and tourism, subject to individual responses by recreationists and visitors to changes in the viewshed. Popular tourism locations near the Lease Area, such as Aquinnah Overlook, would have the potential for greater adverse impacts than more distant locations (see Section 3.20).

Impacts during decommissioning would be similar to the impacts during construction and installation.

Noise: Noise from O&M (predominately WTG operations) could result in impacts on recreation and tourism. Offshore operational noise from the WTGs would be similar to the noise described for other projects under the No Action Alternative and would thus have long-term **minor** adverse impacts. Impacts during decommissioning would be similar to the impacts during construction and installation.

Presence of structures: During O&M of the Proposed Action, the permanent presence of WTGs would create obstacles for recreational vessels. At their lowest point, WTG blades would be 94 feet above the surface. At this height, larger sailboats would need to navigate around the Lease Area, while smaller vessels could navigate through the Lease Area but would still need to adjust routes to bypass WTGs and OSS foundations. No restrictions on fishing or other recreational pursuits would occur during Project operations. However, some recreational anglers could avoid fishing in the Lease Area due to concerns about their ability to safely fish within or navigate through the area.

For recreational anglers harvesting HMS such as tunas, sharks, and billfish, the spacing of the WTGs could impact access to fishing locations. The fishing methods used and the size, strength, and swimming speed of these larger species require significantly more space for fishing compared to other species; as a result, the proposed separation between WTGs could be insufficient for this type of fishing. Anglers who do fish within the Lease Area would need to change their methods (i.e., they would not be able to allow their boats to drift and would need to correct course to avoid WTGs). See Section 3.9 for analysis on for-hire fishing impacts.

The presence of WTGs would also require the USCG to adjust their search and rescue planning and search patterns to allow aircraft to fly within the GAA, potentially leading to a less-optimized search pattern and a lower probability of success for lost or hurt recreationists (see Section 3.17).

The Proposed Action's WTGs would also affect recreation and tourism through visual impacts. When visible (i.e., on clear days in locations with unobstructed ocean views), WTGs would add a developed/industrial visual element to ocean views that were previously characterized by open ocean, broken only by transient vessels and aircraft passing through the view. However, the visual impact assessment prepared for Revolution Wind (see COP Appendix U3 [EDR 2023]) determined that the Project would not likely be easily detectable when viewed from a distance of 20 miles or more and that only 3% of the land area within the visual study area would contain views of the Project. Revolution Wind has voluntarily committed to use ADLS and non-reflective pure white or light gray paint color, as described in Appendix F to reduce impacts.

The visual contrast created by the WTGs could have a beneficial, adverse, or neutral impact on the quality of the recreation and tourism experience depending on the viewer's orientation, activity, and purpose for visiting the area. As discussed in Section 3.18.1, research suggests that at a distance of 15 miles, few beach visitors (only 6%) would select a different beach based on the presence of offshore wind turbines. An estimated 55 WTGs would fall within this distance, based on the proposed Project array. Considering these factors, BOEM expects the impact of visible WTGs on the use and enjoyment of recreation and tourist facilities and activities during O&M of the Proposed Action Alternative to be long term and **minor** adverse, subject to individual responses by recreationists and visitors to changes in the viewshed. Popular tourism locations near the Lease Area, such as Aquinnah Overlook, would have the potential for greater adverse impacts than more distant locations (see Section 3.20). Although some visitors to south-facing coastal or elevated locations could alter their behavior, this changed behavior is unlikely to meaningfully affect the recreation and tourism industry as a whole.

Additionally, increased beach visitation by individuals who view the WTGs as positive would offset some lost trips from visitors who consider views of WTGs to be negative (Parsons and Firestone 2018). As disclosed in Section 3.18.2.3.1, the PDE analyzed for the Project allows for installing wind turbines that may reach 873 feet to the tip of blade (52% taller than those studied by Parsons and Firestone) with a rotor diameter of 538 feet (9% larger rotor diameter than those studied by Parsons and Firestone). Although it is predictable that the percentage of social acceptance or change in choice may shift, the shift would not be proportional to the difference in the size and scale of the wind turbines in Parsons and Firestone's 2018 study and those analyzed in this EIS.

Overall, the impacts on most recreational pursuits would be long term but **minor** adverse, while the impact on for-hire fishing would be **moderate** adverse because these enterprises are more likely to be materially affected by displacement, competition for resources, and longer transit times in a manner similar to commercial fishing businesses.

Conversely, charter cruises could also choose to market the operational WTGs as a tourist destination, although their distance from shore could limit some interest. Scour protection around the WTG foundations would likely attract forage fish as well as game fish, which could provide new opportunities for certain recreational anglers. A 1989 survey of recreational fishermen and divers in the Gulf of Mexico found that fishermen were willing to travel up to 45 nm offshore and divers 77 nm offshore to visit abandoned platforms that have been reefed (Stanley and Wilson 1989). A subsequent 2002 study (Hiett and Milon 2002) also found that that there is substantial recreational activity associated with the presence of oil and gas structures in the Gulf of Mexico from Alabama through Texas. These structures range from directly offshore in 10-foot water depths to complex facilities in water depths up to almost 10,000 feet at more than 80 miles from shore (NOAA 2021). The report estimated a total of $324.6 million in economic output in coastal counties of the Gulf region associated with fishing and diving activities near oil and gas structures. A survey of United Kingdom offshore recreational fishermen by Hooper et al. (2017) found that respondents frequently fished at offshore wind farms, with a mean distance from shore of 10 nm. Approximately one quarter of the respondents reported having fished within or around the perimeter of wind farms. Likewise, evidence from Block Island Wind Farm indicates an increase in recreational fishing near the WTGs (Smythe et al. 2018). These surveys suggest that the Project could attract recreational fishing and diving activity, providing a long-term **minor** benefit. The Project could also increase tourism activity during peak tourism months (Carr-Harris and Lang 2019).

Impacts during decommissioning would be similar to the impacts during construction and installation.

<u>Vessel traffic:</u> For regularly scheduled maintenance and inspections, Revolution Wind anticipates that, on average, up to nine crew transfer vessels or service operation vessels would operate in the Lease Area. In other maintenance or repair scenarios, additional vessels could be required. However, this low volume of vessel traffic would not be anticipated to affect ongoing recreational use. O&M of the Proposed Action would therefore have **negligible** adverse impacts on onshore or offshore recreation and tourism.

Impacts during decommissioning would be similar to the impacts during construction and installation.

Onshore Activities and Facilities

<u>Anchoring and new cable emplacement/maintenance:</u> No anchoring impacts would occur as a result of onshore activities. No onshore cable maintenance would be required unless a fault or failure occurs. If cable repair or replacement or remedial cable protection is required, maintenance activities would be limited to the disturbance corridors previously defined for construction. Therefore, O&M and decommissioning impacts would represent a **negligible** adverse impact on recreational users.

<u>Light:</u> Based results of the viewshed analysis (see COP Appendix U1 [EDR 2023]), portions of the lightning masts for OnSS and ICF features could be visible from some views. However, lighting at these facilities would be limited to yard and task lighting for emergency maintenance or repairs. Both categories would be switched lights and only in use if staff are present. Operational lighting for the OnSS and ICF would comply with Quonset Development Corporation lighting regulations and be mounted with the lamp horizontal to the ground (light facing straight down) or with a lamp tilt no more than 25 degrees from the horizon. As such, it is anticipated that the OnSS and ICF would result in **negligible** adverse lighting impacts to the recreation and tourism activities in the GAA. Impacts during decommissioning would be similar to the impacts during construction and installation.

<u>Noise:</u> Operations of onshore Project components (i.e., offshore to onshore transition joint bays, onshore transmission cable route, OnSS, and ICF) would have **negligible** adverse noise impacts intermittently over the life of the Project to onshore recreation and tourism because these components would only require periodic routine maintenance.

Impacts during decommissioning would be similar to the impacts during construction and installation.

Presence of structures: Based on results of the viewshed analysis (see COP Appendix U1 [EDR 2023]), it is anticipated that the OnSS and ICF could be visible from approximately 15% of the viewshed analysis area. However, the presence of existing landscape vegetation along roadways could further reduce the extent of visual impacts. For more distant views from Wickford Historic District and Wickford Harbor/Wickford Village State Scenic Area, and Narragansett Bay, visibility would only include the upper portions of a few proposed transmission structures. However, where visible at foreground distances, the proposed OnSS and ICF could introduce new industrial/utility structures into the landscape. Nevertheless, the proposed OnSS and ICF would not be out of scale or character with the existing types of development currently present in the vicinity, such as the existing Davisville Substation or the structures at nearby Quonset Business Park. As such, it is anticipated that the OnSS and ICF would result in **negligible** adverse visual impacts to recreation and tourism activities in the GAA.

Impacts during decommissioning would be similar to the impacts during construction and installation.

Vessel traffic: Potential traffic impacts would be similar to the construction phase but likely reduced due to fewer equipment and vehicle trips. Impacts during decommissioning would be similar to the impacts during construction and installation: temporary and **minor** adverse.

3.18.2.3.3 Cumulative Impacts

Offshore Activities and Facilities

Anchoring and new cable emplacement/maintenance: Up to approximately 6,550 acres of anchoring and 18,995 acres of cabling seafloor disturbance could occur from ongoing and planned actions, including the Proposed Action, in the recreation and tourism GAA. Project-related construction anchorages would noticeably add to disturbances of marine species and their habitats important to recreational fishing and could require recreational and tourism vessels to navigate around moving and anchored construction-related vessels while in transit. The buried cabling would also present short-term navigational hazards. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in short-term and long-term **minor** adverse cumulative impacts on recreation and tourism.

Light: New lighting from the Proposed Action would contribute to a 11% increase in in-water lighting sources from past, present, and reasonably foreseeable future projects within the GAA by introducing built visual elements to views previously characterized by dark, open ocean.

Given the distance to most recreational viewers and potential for atmospheric interference, lighting from the Proposed Action, when combined with past, present, and reasonably foreseeable projects, would result in long-term intermittent **minor** adverse cumulative impacts on recreation and tourism.

Noise: Noise from construction could lead to the displacement of fish in and around construction sites, leading to spatial competition, depending on migrating patterns. Recreational boaters and tourists would not be permitted to approach active construction zones and would therefore not be expected to experience noise impacts from offshore construction. Because of the distance from receptors, the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in localized short-term **minor** to **moderate** adverse cumulative impacts on recreation and tourism due to construction activities, whereas noise from O&M activities would result in long-term **negligible** adverse cumulative impacts.

Presence of structures: The Proposed Action would noticeably add up to 102 foundations to the 893 foundations estimated for the No Action Alternative within the GAA. New structures related to the Proposed Action would add to the long-term impacts on recreation and tourism throughout the life of the Project (up to 35 years, plus up to an additional 2 years for decommissioning) by increasing navigational complexity; risks of structure allision; route adjustments for races, sightseeing, and fishing; loss and damage of fishing gear to scour and cable protection; and difficulty anchoring over scour and cable protection. However, new in-water structures from the Proposed Action could benefit recreation and tourism by attracting recreational vessels to WTGs for fishing and sightseeing activities. Therefore, new in-water structures from the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in short-term and long-term **minor** to **moderate** adverse and long-term **minor** beneficial cumulative impacts on recreation and tourism.

Construction and O&M of the Project would also noticeably increase the visual impacts on recreational and tourism users by adding up to 100 WTGs and two OSSs to the No Action Alternative. Based on visual simulations described in Sections 3.18.1.1, 3.18.2.2.1, and 3.18.2.2.2, the visibility of large offshore structures is not expected to impact shore-based recreation and tourism as a whole. Cumulative visual impacts on recreation and tourism resulting from the Proposed Action, when combined with past, present, and reasonably foreseeable projects, would be short term and **minor** adverse for onshore viewers at sensitive viewing locations because of the distance and natural atmospheric interference. Cumulative visual impacts on recreation and tourism resulting from the Proposed Action, when combined with past, present, and reasonably foreseeable projects, would be short term **minor** to **moderate** adverse for offshore recreational users and would increase as users approach the WTGs. Impacts to viewers at sensitive viewing locations are addressed in Section 3.20.

Vessel traffic: Project vessels would noticeably add to disturbances of marine species and their habitats important to recreational fishing and could require recreational and tourism vessels to navigate around moving construction-related vessels while in transit. However, non-Project traffic would be able to adjust routes and avoid the work area and transiting construction vessels. BOEM estimates a peak of 210 vessels at sea on a daily basis due to offshore wind project construction and O&M over a 10-year time frame, with most of these vessels remaining in the vicinity of their respective lease areas. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in short-term and long-term **minor** adverse cumulative impacts on recreation and tourism.

Onshore Activities and Facilities

Anchoring and new cable emplacement/maintenance: No anchoring impacts would occur as a result of onshore activities. No onshore cable maintenance would be required unless a fault or failure occurs. If cable repair or replacement or remedial cable protection is required, maintenance activities would be limited to the disturbance corridors previously defined for construction. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in temporary **negligible** adverse cumulative impacts to onshore recreation and tourism.

Light: Construction associated with the Proposed Action could add temporary minor adverse light impacts experienced by onshore recreational users near the landfall work area, onshore transmission cable route, or onshore facilities or from the aviation hazard lighting on the new WTGs. Long-term increases in operational lighting from the Proposed Action would be **negligible** adverse. Therefore, the Proposed

Action when combined with past, present, and reasonably foreseeable projects would result in temporary **minor** adverse cumulative impacts to onshore recreation and tourism.

Noise: As with lighting, construction activities would add noise from the construction of onshore facilities to the ambient noise levels of the No Action Alternative. Onshore construction noise would be localized to the source, short term **minor** to **moderate** adverse, depending on the distance of the receptor from the source. Long-term increases in operational noise from the Proposed Action would be **negligible** adverse. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in temporary **minor** adverse cumulative impacts to onshore recreation and tourism.

Presence of structures: Onshore construction and installation would add an O&M facility, an interconnection facility, and an OnSS to the No Action Alternative. These new onshore structures would only result in **minor** adverse visual impacts experienced by recreational users due to the existing settings at these locations (see Section 3.20 for details on potential visual impacts). When considered cumulatively with past, present, and reasonably foreseeable activities, the Proposed Action would result in temporary **negligible** to **minor** adverse cumulative visual impacts on recreation and tourism.

Vessel traffic: Construction vehicles associated with the Proposed Action could add traffic delays experienced by recreational travelers on local roadways. Long-term increases in operational traffic from the Proposed Action would be **negligible** adverse. Therefore, the Proposed Action, when combined with past, present, and reasonably foreseeable projects, would result in temporary **minor** adverse cumulative impacts to onshore recreation and tourism.

3.18.2.3.4 Conclusions

Project construction and installation and decommissioning would introduce noise, lighting, human activity, vehicles and vessels (increasing potential collision risk), and interruption to access points in the GAA. Noise, lighting, and human activity impacts from Project O&M would occur, although at lower levels than those produced during construction and decommissioning. BOEM anticipates that the impacts resulting from the Proposed Action alone would range from **negligible** to **minor** adverse and short term to long term. Project activities are expected to contribute to several IPFs, the most prominent being noise and vessel traffic during construction and the presence of offshore structures during operations. Noise and vessel traffic would have impacts on visitors, who may avoid onshore and offshore noise sources and vessels, and impacts on recreational fishing and sightseeing as a result of the impacts on fish, invertebrates, and marine mammals. BOEM expects the overall impact on recreation and tourism from the Proposed Action alone to be **minor** adverse; however, the overall effect would be small, and recreation and tourism would be expected to recover completely without remedial or mitigating action.

In the context of other reasonably foreseeable environmental trends and planned actions, the impacts under the Proposed Action resulting from individual IPFs would range from **negligible** to **moderate** adverse and **minor** beneficial. Impacts would result from short-term impacts during construction: noise, anchored vessels, and hindrances to navigation; and the long-term presence of cable hard cover and structures in the GAA during operations, with resulting impacts on recreational vessel navigation and visual quality. Beneficial impacts would result from the reef effect and sightseeing attraction of offshore wind energy structures. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action, when combined with past, present, and reasonably foreseeable activities, would result in **minor** adverse impacts and **minor** beneficial impacts to recreation and tourism.

The overall effect would be small, and recreation and tourism would be expected to recover completely with no mitigating action required.

3.18.2.4 Alternatives C, D, E, and F

Table 3.18-2 provides a summary of IPF findings for these alternatives.

3.18.2.4.1 Conclusions

Although Alternatives C through F would reduce the number of WTGs and associated IACs, the presence of WTGs could still increase congestion, space conflicts, navigation risks, and the potential for collision, albeit at lower levels than the Proposed Action. The reduced number of WTGs under these alternatives could provide a long-term beneficial impact for some recreational viewers. Therefore, BOEM expects that the impacts resulting from each alternative alone would range from **negligible** to **moderate** adverse.

In the context of other reasonably foreseeable environmental trends and planned actions, BOEM also expects that each alternative’s impacts would be similar to the Proposed Action (with individual IPFs leading to impacts ranging from **negligible** to **moderate** adverse and **minor** beneficial). The overall impacts of each alternative when combined with past, present, and reasonably foreseeable activities would therefore be the same as those under the Proposed Action: **minor** adverse and **minor** beneficial.

3.18.2.5 Alternative G: Impacts of the Preferred Alternative on Recreation and Tourism

Table 3.18-2 provides a summary of IPF findings for this alternative.

3.18.2.5.1 Conclusions

Although Alternative G would reduce the number of WTGs and associated IACs, the presence of WTGs could still increase congestion, space conflicts, navigation risks, and the potential for collision, albeit at lower levels than the Proposed Action. The reduced number of WTGs under this alternative could provide a long-term beneficial impact for some recreational viewers. Therefore, BOEM expects that the impacts resulting from this alternative alone would range from **negligible** to **moderate** adverse.

In the context of other reasonably foreseeable environmental trends and planned actions, BOEM also expects that this alternative’s impacts would be similar to the Proposed Action (with individual IPFs leading to impacts ranging from **negligible** to **moderate** adverse and **minor** beneficial). The overall impacts of this alternative when combined with past, present, and reasonably foreseeable activities would therefore be the same as the Proposed Action: **minor** adverse and **minor** beneficial.

3.18.2.6 Mitigation

There are no potential additional mitigation measures for recreation and tourism identified in Table F-2 or Table F-3 of Appendix F.

3.19 Sea Turtles

3.19.1 Description of the Affected Environment for Sea Turtles

Geographic analysis area: The GAA for sea turtles comprises the Northeast Shelf and Southeast Shelf Large Marine Ecosystems, as shown in Figure 3.19-1 and also described in Appendix G. This broad area captures the typical movement range within U.S. waters of most sea turtles that could occur within the Project vicinity during the construction and installation, O&M, and decommissioning of the Project. Thus, although Project-related impacts to sea turtle habitat are restricted to a relatively small GAA, the GAA for Project impacts to sea turtles is necessarily large due to their movement range.

The intent of the GAAs used in this EIS is to define a reasonable boundary for assessing the potential effects, including cumulative effects, resulting from the IPF with the maximum area of impact from the development of an offshore wind energy industry on the Mid-Atlantic OCS. GAAs for marine biological resources are necessarily large because marine populations range broadly and cumulative impacts can be expressed over broad areas. GAAs are not used as a basis for analyzing the effects of the Proposed Action, which represent a subset of these broader effects and expressed over a smaller area. These impacts are analyzed specific to each IPF.

Affected environment: Four species of sea turtles are known to occur in or near the proposed RWF and RWEC, and all are protected species under the ESA. These are the green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), and Kemp's ridley sea turtle (*Lepidochelys kempii*). The potential impacts of the Proposed Action to these species are assessed in Section 3.19.2. The hawksbill sea turtle (*Eretmochelys imbricata*) is also protected under the ESA but is exceedingly rare in the Project vicinity (Kenney and Vigness-Raposa 2010) (see Figure 3.19-1). The proposed RWF and RWEC are considered outside the normal range of hawksbill turtles, which range predominantly in warmer waters to the south. Individual hawksbill turtles have occasionally occurred in and near the southern New England area after being stunned by exposure to unusual cold-water events and subsequently transported northward by the Gulf Stream into the region. These occurrences are not representative of normal behaviors or distribution. Hawksbill turtles are known to occur in potential construction vessel transit routes to the Gulf of Mexico, but the number of vessel trips being considered over the 2-year construction period (16–17 trips per year) is small compared to the existing baseline of tens of thousands of vessel trips. Should these vessel trips occur, their contribution to cumulative effects on this species would not be measurable. Therefore, while this species does occur in the GAA for sea turtles (defined in Appendix E), the Proposed Action is unlikely to contribute to any measurable cumulative effects, and hawksbill sea turtles are therefore not considered further in this EIS.

Sea turtles primarily inhabit tropical and subtropical seas throughout the world, with several species seasonally ranging into temperate zones to forage. Sea turtles are morphologically adapted for continuous swimming, and they can remain underwater for extended periods, ranging from several minutes to several hours, depending on factors such as daily and seasonal environmental conditions and specific behavioral activities associated with dive types (Hochscheid 2014; National Science Foundation [NSF] and USGS 2011). These adaptations are important because sea turtles often travel long distances between their feeding grounds and nesting beaches (Meylan 1995). There are no nesting beaches or other designated critical habitats near the RWF (Greater Atlantic Regional Fisheries Office [GARFO] 2020), meaning that individuals occurring in the proposed RWF and RWEC are either migrating or foraging. Given this, these individuals likely spend most of the time below the surface, although specifics are species dependent. Underwater observations of 73 sea turtles with 2,742 minutes of video in the Mid-Atlantic found that loggerhead sea turtles were within the near-surface region of the water column a median of 42% of the time (Patel et al. 2016).

The combination of sightings, strandings, tag, and bycatch data provides the best available information on sea turtle distribution. Information about species occurrence in the RWF and RWEC was obtained from various sources, including aerial surveys (Kraus et al. 2016; NEFSC and SEFSC 2018; North Atlantic Right Whale Consortium 2019), regional historical data (Kenney and Vigness-Raposa 2010), and sea turtle stranding records from the Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations (OBIS-SEAMAP) database (Halpin et al. 2009). Table 3.19-1 summarizes potential sea turtle occurrence in the southern New England coastal waters off Rhode Island and Massachusetts. Potential effects to sea turtles, which are discussed in Section 3.19.2, are based on the likelihood of occurrence.

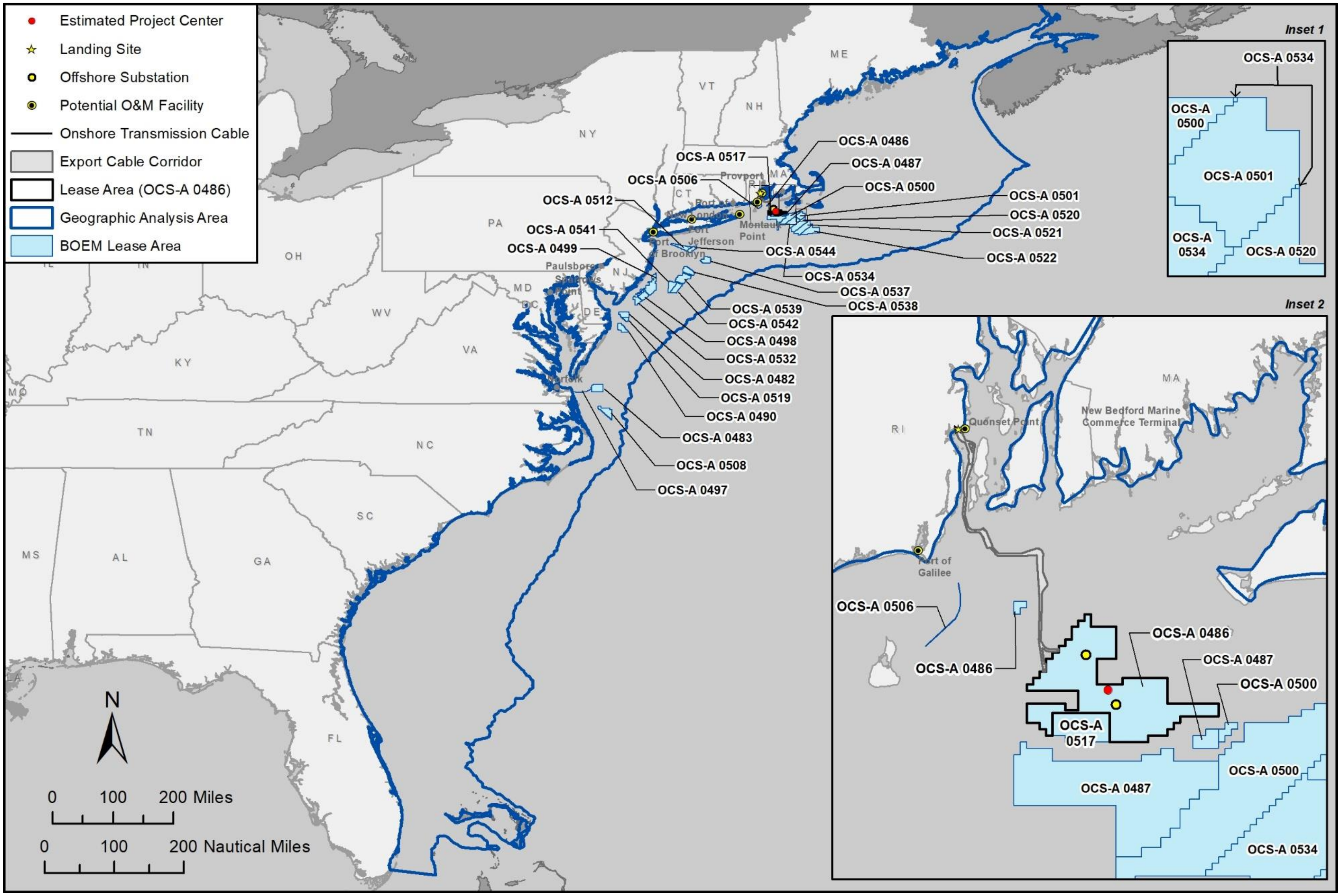

Figure 3.19-1. Geographic analysis area for sea turtles.

Table 3.19-1. Frequency of Sea Turtle Species Occurrence in the Revolution Wind Farm and Revolution Wind Export Cable

Common Name	Scientific Name	Distinct Population Segment*/Population	Endangered Species Act Status*	Frequency of Occurrence†, ¶	Seasonal Occurrence‡,§	Likelihood of Occurrence§,¶	Included in Impact Analysis?
Green sea turtle	*Chelonia mydas*	North Atlantic	T	Regular, limits of range	May to November	Unlikely/ uncommon	Yes
Hawksbill sea turtle	*Eretmochelys imbricata*	Throughout range	E	Rare, outside range	May to November	Exceedingly unlikely	No, outside limits of range
Leatherback sea turtle	*Dermochelys coriacea*	Atlantic‡‡	E	Common	May to November	Likely	Yes
Loggerhead sea turtle	*Caretta caretta*	Northwest Atlantic	T	Common	May to November	Likely	Yes
Kemp's ridley sea turtle	*Lepidochelys kempii*	Throughout range	E	Regular	May to November	Likely but infrequent	Yes

* DPS = distinct population segment, E = endangered, T = threatened.

† Data from Kenney and Vigness-Raposa (2010). Common = fewer than 100 observations, regular = 10–100 observations; rare = fewer than 10 observations.

‡ Data from GARFO (2020). Sea turtles may also occur in the Lease Area outside these months.

§ Data from NEFSC and SEFSC (2018). Based on density estimates from Kot et al. (2018) and observations by Kraus et al. (2013, 2014, 2016), O'Brien et al. (2021a, 2021b), and Quintana et al. (2019).

‡‡ A Northwest Atlantic DPS to be listed as threatened has been proposed for leatherback sea turtles (85 *Federal Register* 48332). The Atlantic population considered herein includes this proposed DPS.

Green sea turtle: Green sea turtles are found in tropical and subtropical waters around the globe. They are most commonly observed feeding in the shallow waters of reefs, bays, inlets, lagoons, and shoals that are abundant in algae or marine grass (NMFS and USFWS 2007). In U.S. waters, they are typically found in the Gulf of Mexico or coastal waters south of Virginia (USFWS 2021). Juveniles and subadults are occasionally observed in Atlantic coastal waters as far north as Massachusetts (NMFS and USFWS 1991), including the waters of Long Island Sound and Cape Cod Bay (Cetacean and Turtle Assessment Program 1982). The species' primary nesting beaches are located in Costa Rica, Mexico, the United States (Florida), and Cuba. According to Seminoff et al. (2015), nesting trends are generally increasing for this population. Based on feeding and habitat preferences, the species is less likely to occur in the RI/MA WEA and MA WEA. Kenney and Vigness-Raposa (2010) recorded one confirmed sighting within the RI/MA WEA in 2005. The STSSN reported one offshore and 20 inshore green sea turtle strandings between 2017 and 2019, and green sea turtles are found each year stranded on Cape Cod beaches (NMFS STSSN 2020; Wellfleet Bay Wildlife Sanctuary [WBWS] 2018). Five green sea turtle sightings were recorded off the Long Island shoreline 10 to 30 miles southwest of the RI/MA WEA in aerial surveys conducted from 2010 to 2013 (NEFSC and SEFSC 2018), but none were positively identified in multiseason aerial surveys of the RI/MA WEA from October 2011 to June 2015 (Kraus et al. 2016).

Juvenile green sea turtles represented 6% of 293 cold-stunned turtle stranding records collected in the inshore waters of Long Island Sound from 1982 to 1997 (Gerle et al. 2000). These and other sources of information indicate that juvenile green sea turtles occur at least periodically in the shallow nearshore waters of Long Island Sound and the coastal bays of New England (Morreale et al. 1992).

Based on the available information, green sea turtle occurrence in the RWF and RWEC appears to be unlikely but cannot be ruled out. They are most likely to occur as juveniles or subadults in the shallow coastal waters of Rhode Island and Massachusetts and in Narragansett Sound within and adjacent to the RWEC corridor.

Hawksbill sea turtle: Hawksbill sea turtles are a circumtropical species that in the Atlantic Ocean is most observed between 30°N and 30°S latitude. In the western Atlantic, hawksbills are typically found in the Caribbean Sea and the Gulf of Mexico off the coasts of Florida and Texas. No nesting beaches exist in the northeast United States, and records of species occurrence near the Lease Area are rare. This species is likely to occur elswhere in the GAA, specifically in vessel transit routes to ports in the Gulf of Mexico (see Appendix B). The OBIS-SEAMAP database (Halpin et al. 2009) contains only six hawksbill sea turtle observation records for the region. These comprise two verified stranding records, both from Martha's Vineyard in 1911, and four shipboard survey records at and seaward of the shelf break to the east and south of the Lease Area. The species was not observed in recent multiyear aerial and shipboard surveys of the RI/MA WEA and vicinity (Kraus et al. 2016). Therefore, although individual hawksbills could conceivably occur in the Project vicinity, they would be extralimital and outside their normal range. Hawksbill sea turtle occurrence within the Lease Area and RWEC corridor is unlikely. The species could be encountered along potential construction vessel transit routes between the Lease Area and ports in the Gulf of Mexico (see Appendix B) and the southeast United States, but the number of vessel transits to these distant ports would be limited. At-sea vessels transiting from non-local ports traveling greater than 10 knots (5.1 m per second) would employ PSOs or NMFS-approved visual detecting devices. Given the low density of hawksbill sea turtles and the low number of vessel transits from non-local ports, the likelihood of an encounter resulting in a ship strike is very low. Additionally, the measures proposed in the *Protected Species Mitigation and Monitoring Plan* (Revolution Wind 2022a) and adherence to NOAA guidelines for turtle strike avoidance measures (see Appendix F) would further reduce the chance of any adverse effects to the species from the Proposed Action. Therefore, due to the very low probability of an encouter with a hawksbill sea turtle, this species is not considered further in this analysis.

Leatherback sea turtle: The leatherback is the most globally distributed sea turtle species, ranging broadly from tropical and subtropical to temperate regions of the world's oceans (NMFS and USFWS 1992). Leatherbacks are a pelagic species, but they are commonly observed in coastal waters along the OCS (NMFS and USFWS 1992). The breeding population estimate (total number of adults) in the North Atlantic is 34,000 to 95,000, and, aside from the western Caribbean, nesting trends at all other Atlantic nesting sites are generally stable or increasing (NMFS and USFWS 2013; Turtle Expert Working Group 2007). Atlantic Marine Assessment Program for Protected Species surveys conducted from 2010 through 2013 routinely documented leatherbacks in New England waters, including the RI/MA WEA, during the summer months (NEFSC and SEFSC 2018). Kraus et al. (2016) recorded 153 observations in monthly aerial surveys, all between May and November, with a strong peak in August. Monthly aerial surveys on the New York Bight from 2017 through 2020 documented a total of 37 leatherback sea turtles, with an additional 503 unidentified sea turtles observed (Tetra Tech and LGL Ecological Research Associates, Inc. 2020). During the summer (June–August) and fall (September–November) months; leatherback density within the RI/MA WEA (refer to Figure 1.1-2) was estimated to be 0.0063 animals per km^2 and 0.0087 animals per km^2, respectively, compared to densities of 0.00588 animals per km^2 for the winter and spring months (December–May) (Kot et al. 2018; Kraus et al. 2016). The STSSN reported 19 offshore and 77 inshore leatherback sea turtle strandings between 2017 and 2019, the highest number among all turtle species reported (NMFS STSSN 2020). Kraus et al. (2016) data indicated that leatherbacks would be the most abundant sea turtle species in the RWF and RWEC, which is consistent with the other information on sea turtle occurrence in the vicinity presented here. Based on this information, leatherback sea turtles are expected to occur commonly in the RWF and RWEC between May and November, with the highest probability of occurrence from July through October (Sherrill-Mix et al. 2008).

Loggerhead sea turtle: Foraging loggerhead sea turtles range widely and have been observed along the entire Atlantic Coast as far north as Canada (Brazner and McMillan 2008; Ceriani et al. 2014; Shoop and Kenney 1992). Regional abundance on the northwest Atlantic, corrected for unidentified turtles in proportion to the ratio of identified turtles, estimates about 801,000 loggerheads (NEFSC and SEFSC 2011). The three largest nesting subpopulations responsible for most of the production in the western North Atlantic (peninsular Florida, northern United States, and Quintana Roo, Mexico) have all been declining since at least the late 1990s, thus indicating a downward trend for this population (Turtle Expert Working Group 2009). In southern New England, loggerhead sea turtles can be found seasonally, primarily during the summer and fall, but are typically absent during the winter (Kenney and Vigness-Raposa 2010; Shoop and Kenney 1992). Atlantic Marine Assessment Program for Protected Species surveys reported loggerhead sea turtles as the most commonly sighted sea turtles on the shelf waters from New Jersey to Nova Scotia, Canada. During the December 2014 to March 2015 aerial abundance surveys, 280 individuals were recorded (Palka et al. 2017). Large concentrations were regularly observed south and east of Long Island near the RI/MA WEA (NEFSC and SEFSC 2018). Kraus et al. (2016) observed loggerhead sea turtles within the RI/MA WEA in the spring, summer, and fall, with the greatest density of observations in August through September. The density of loggerhead sea turtles within the RI/MA WEA was estimated to be 0.00755 animals per km^2 at peak occurrence during the fall months, 0.00206 animals per km^2 during the summer months, and 0.035 animals per km^2 for the rest of the year (Kot et al. 2018; Kraus et al. 2016). The STSSN reported six offshore and 58 inshore loggerhead sea turtle strandings between 2017 and 2019 (NMFS STSSN 2020). In New York State waters, the New York Marine Rescue Center (NYMRC) documented 816 strandings of loggerhead sea turtles from 1980 to 2018 (NYMRC 2021). Winton et al. (2018) estimated densities using data from 271 satellite tags deployed on loggerhead sea turtles between 2004 and 2016 and found that tagged loggerheads primarily occupied the OCS from Long Island, New York, south to Florida, but relative densities in the RI/MA WEA increased during the period between July and September. Collectively, available information indicates that loggerhead sea turtles are expected to occur commonly in the RWF and RWEC as adults, subadults, and juveniles from the late spring through fall, with the highest probability of occurrence from July through September (Winton et al. 2018).

Kemp’s ridley sea turtle: Kemp’s ridley sea turtles are most commonly found in the Gulf of Mexico and along the U.S. Atlantic Coast. The species is primarily associated with habitats on the OCS, with preferred habitats consisting of sheltered areas along the coastline, including estuaries, lagoons, and bays (Burke et al. 1994; NMFS 2019), and nearshore waters less than 120 feet (37 m) deep (Seney and Landry 2008; Shaver et al. 2005; Shaver and Rubio 2008), although they can also be found in deeper offshore waters. Kemp’s ridley sea turtle nesting is largely limited to the beaches of the western Gulf of Mexico, primarily in Tamaulipas, Mexico. Nesting also occurs in Veracruz, and a few historical records exist for Campeche, Mexico. In the United States, nesting occurs primarily in Texas and occasionally in Florida, Alabama, Georgia, South Carolina, and North Carolina (NMFS and USFWS 2015). Nesting outside of Gulf of Mexico states is rare but has been observed as far north as New York State (NPS 2018). Recent data show that the total number of recorded nests from all beaches in Mexico peaked in 2012 at 22,458 but declined to 12,060 in 2014, the last year for available data (NMFS and USFWS 2015). Juvenile and subadult Kemp’s ridley sea turtles are known to travel as far north as Cape Cod Bay during summer foraging (NMFS et al. 2011). Visual sighting data are limited because this small species is difficult to observe using typical aerial survey methods (Kraus et al. 2016). In all, five observations were recorded in the RI/MA WEA during 4 years of aerial surveys, all in August and September 2012 (Kraus et al. 2016). The species has been sighted near the proposed RWF in other survey efforts, mostly to the south and west of the RI/MA WEA (North Atlantic Right Whale Consortium 2019).

The density of Kemp’s ridley sea turtles within the RI/MA WEA was conservatively estimated to be 0.00925 animals per km^2 throughout the year for exposure modeling purposes (Kot et al. 2018; Kraus et al. 2016). However, this estimate does not accurately reflect seasonality of occurrence. Like all sea turtle species occurring in the region, the Kemp’s ridley sea turtle is most commonly observed from late spring through early fall when suitable water temperatures are present, with occurrences later in the year limited to individuals that have been cold stunned and are outside their normal seasonal range. The STSSN reported six offshore and 69 inshore Kemp’s ridley sea turtle strandings between 2017 and 2019 (NMFS STSSN 2020), and the NYMRC has documented the stranding of 620 Kemp’s ridley sea turtles within New York State waters between 1980 and 2018 (NYMRC 2021). Cold-stunned Kemp’s ridley sea turtles are often found stranded on the beaches of Cape Cod (Lui et al. 2019; WBWS 2019). Based on this information, Kemp’s ridley sea turtles could occur infrequently as juveniles and subadults from July through September. The highest likelihood of occurrence within the Project limits is along the RWEC corridor in the protected waters of Narragansett Bay. Occurrence in the RWF is possible the likelihood of occurrence is difficult to assess from available data because this species is difficult to detect in visual surveys (Kraus et al. 2016). On this basis, Kemp's ridley sea turtles could occur in the RWF and RWEC in low numbers on an annual basis throughout the life of the Project.

3.19.2 Environmental Consequences

3.19.2.1 Relevant Design Parameters, Impact-Producing Factors, and Potential Variances in Impacts

The analysis presented in this section considers the impacts resulting from the maximum-case scenario under the PDE approach developed by BOEM to support offshore wind project development (Rowe et al. 2017). The maximum design size specifications defined in Appendix D, Table D-1 are PDE parameters used to conduct this analysis. Several Project parameters could change during the development of the final Project configuration, potentially reducing the extent and/or intensity of impacts resulting from the associated IPFs.

The following design parameters would result in reduced impacts relative to those generated by the design elements considered under the PDE:

- The permitting and installation of fewer WTGs, resulting in fewer offshore structures and reduced IAC cable length. This would reduce the extent of temporary to long-term impacts on marine mammals by
  - reducing the extent and duration of underwater noise impacts from WTG foundation installation; and
  - reducing the extent of reef and hydrodynamic effects resulting from structure presence.
- The Project could use a casing pipe method to construct the RWEC sea-to-shore transition, which would result in less acoustic impact than vibratory pile driving to construct a cofferdam (Zeddies 2021).
- The use of a temporary cofferdam for RWEC sea-to-shore transition construction would reduce suspended sediment effects on sea turtles.

See Appendix E2 for a summary of IPFs analyzed for sea turtles across all action alternatives. IPFs that are either not applicable to the resource or determined by BOEM to have a negligible adverse effect are excluded from Chapter 3 and provided in Appendix E, Table E2-6.

Table 3.19-2 provides a summary of IPF findings carried forward for analysis in this section. Each alternative analysis discussion consists of the construction and installation phase, the O&M phase, the decommissioning phase, and the cumulative analysis. If these analyses are not substantially different, then they are presented as one discussion. This comparison considers the implementation of all EPMs proposed by Revolution Wind to avoid and minimize adverse impacts on sea turtles. These EPMs are summarized in Appendix F, Table F-1.

A detailed analysis of the Proposed Action is provided following the table. Detailed analysis of other considered action alternatives is also provided below the table if analysis indicates that the alternative(s) would result in substantially different impacts than the Proposed Action. Offshore and onshore IPFs are addressed separately in the analysis if appropriate for the resource; not all IPFs have both an offshore and onshore component. Where feasible, calculations for specific alternative impacts are provided in Appendix E4, to facilitate reader comparison across alternatives.

The conclusion section within each alternative analysis discussion includes rationale for the overall effect determination. Overall impacts associated with the each alternative would result in **minor** adverse impacts on sea turtles in the GAA because unavoidable adverse impacts on individual sea turtles could occur, but those impacts are unlikely to measurably affect the viability of any sea turtle species at the population level.

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Table 3.19-2. Alternative Comparison Summary for Sea Turtles

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
Accidental releases and discharges	**Offshore**: While marine vessels are an inherent source of accidental releases of trash, debris, and contaminants, existing regulatory requirements would effectively avoid and minimize these impacts such that the resulting effects to sea turtles would be **negligible** adverse. All future offshore wind projects would be required to comply with regulatory requirements related to the prevention and control of accidental spills administered by the USCG and the BSEE Oil spill response plans are required for each project and would provide for rapid spill response, clean-up, and other measures that would help to minimize potential impacts on affected resources. Given the low probability of a large spill event, impacts to sea turtles are likely to be **negligible** adverse.	**Offshore**: BOEM prohibits the discharge or disposal of solid debris into offshore waters during any activity associated with the construction and operation of offshore renewable energy facilities (30 CFR 585.105(a)). The USCG similarly prohibits the dumping of trash or debris capable of posing entanglement or ingestion risk (MARPOL, Annex V, Public Law 100−220 (101 Stat. 1458)). The Project would comply with these requirements (VHB 2023). Given these restrictions, the short-term impacts to sea turtles from trash and debris from the Project would be **negligible** adverse. Project EPMs, permit requirements, controls, and procedures would be implemented as part of the Project to reduce the potential or extent of offshore spills, thereby avoiding or minimizing impacts on water quality. Should a spill occur, response and containment procedures would limit the reach of the spill to a localized area, where changes to water quality would be detectable and would exceed water quality standards. Given the low potential for spills and minimal risk of exposure to small temporary spills, the risk from construction-related spills is **negligible** to **minor** adverse. Impacts on sea turtles from accidental spills or releases of pollutants are considered **minor** adverse during O&M because of the low probability of the risk and EPMs. Cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **negligible** to **minor** adverse because of the regulatory protections and limited likelihood of sea turtle exposure.	**Offshore:** Effects on sea turtles from accidental releases and discharges under Alternatives C through F would be similar to those described for the Proposed Action. Alternatives C through F would include the same EPMs to avoid and minimize impacts to sea turtles from accidental releases and discharges. Effects on sea turtles would therefore be **negligible** adverse and short term. While unlikely, vessels collision or allisions could occur during Project construction, presenting the potential risk of larger spills, potentially harmful to sea turtles. Alternatives C through F would slightly reduce total chemical and lubricant uses relative to the Proposed Action, but this effect would be small in comparison to projected chemical use on the Mid-Atlantic OCS. When combined with other offshore wind projects, up to approximately 34 million gallons of coolants, fuels, oils, and lubricants could cumulatively be stored within WTG foundations and OSSs. However, all future offshore energy development projects would comply with BOEM and USCG regulations that prohibit dumping of trash and debris and require measures to avoid and minimize accidental spills. Cumulative impacts associated with Alternative C when combined with past, present, and reasonably foreseeable future activities would be **negligible** to **minor** adverse.				**Offshore:** Similar to Alternatives C through F, effects on sea turtles from accidental releases and discharges under Alternative G would be similar to those described for the Proposed Action. Alternative G would include the same EPMs to avoid and minimize impacts to sea turtles from accidental releases and discharges. Effects on sea turtles would therefore be **negligible** adverse and short term. Cumulative impacts associated with Alternative G when combined with past, present, and reasonably foreseeable future activities would be **negligible** to **minor** adverse.
Climate change	**Offshore**: Over time, climate change, in combination with coastal and offshore development, would alter existing habitats, potentially rendering some areas unsuitable for certain species and more suitable for others. However, sea turtle populations likely to be impacted by the Project are stable or generally increasing from historic lows. Therefore,	**Offshore**: Northward shifts in sea turtle distributions due to warming waters could result in magnification of the anticipated impacts due to increased exposure. However, this magnification includes potential benefits associated with the creation of artificial reef habitat and could represent an increasing impact over the life of the Project. Therefore, the Proposed Action when combined with other past, present, and reasonably foreseeable actions is expected to result in **minor**	**Offshore:** The types of impacts from global climate change described for the No Action Alternative would occur under Alternatives C through F, but as with the Proposed Action, this alternative could also contribute to a long-term net decrease in GHG emissions. However, northward shifts in sea turtle distributions due to warming waters could result in magnification of the anticipated impacts due to increased exposure. This magnification includes potential benefits associated with the creation of artificial reef habitat and could represent an increasing impact over the life of the Project. Therefore, Alternatives C through F when combined with other past, present, and reasonably foreseeable actions and ongoing environmental trends is expected to result in **minor** adverse cumulative impacts to sea turtles.				**Offshore:** Similar to Alternatives C through F, the types of impacts from global climate change described for the No Action Alternative would occur under Alternative G, but as with the Proposed Action, this alternative could also contribute to a long-term net decrease in GHG emissions. Alternative G when combined with other past, present, and reasonably foreseeable actions and ongoing environmental trends is

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
	potential climate change impacts would be **minor** adverse.	adverse cumulative impacts to sea turtles due to the anticipated shifts in distributions.					expected to result in **minor** adverse cumulative impacts to sea turtles.
Noise	**Offshore**: Under the No Action Alternative, human activities would continue to generate underwater noise with the potential to affect sea turtles. These short-term impacts on individuals are not expected to result in population-level effects; the effects of impulsive noise on sea turtles would therefore be **minor** adverse, while effects of non-impulsive noise on sea turtles would be **negligible** adverse because of the patchy distribution of sea turtles and limited likelihood of behavioral responses to expected noise levels.	**Offshore**: A temporary increase in underwater noise could impact sea turtles if they are present in the area during the time of RWF and offshore RWEC construction. Sea turtles that are close to impact pile driving or UXO detonations could experience a temporary or permanent loss of hearing sensitivity. Sea turtles could also respond to vessel approach and/or noise with a startle response and a temporary stress response. Based on the combination of minimization measures and the low numbers of sea turtles expected in the RWF and RWEC, however, impacts to sea turtles from impact pile driving and UXO detonations are expected to be **negligible** to **minor** adverse and impacts to sea turtles from vessel noise would be **negligible** adverse. Likewise, underwater noise impacts from HRG surveys are expected to be **minor** adverse and aircraft noise impacts sea turtles are expected to be **negligible** adverse because exposures would be limited in extent and temporary in duration. Project decommissioning would require the use of construction vessels of similar number and class as those used during construction, and would therefore range from **negligible** to **minor** adverse. Sea turtle hearing is largely within the frequency range (< 1,200 Hz) of operational wind turbines; therefore, it is possible that wind turbine noise could be heard by sea turtles, although behavioral responses are unlikely based on the established threshold, resulting in **negligible** adverse effects. Based on the above findings, noise-related impacts of the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in **negligible** to **minor** adverse cumulative impacts to sea turtles, depending upon the noise source.	**Offshore:** See Section 3.19.2.3.1 for construction analysis. Alternatives C through F would include the same, or similar, operational and decommissioning noise-producing activities as those described for the Proposed Action but would be reduced based on the reduction in the number of WTGs and other operational elements. Thus, the impacts of operational and cumulative noise are also considered **negligible** to **minor** adverse.				**Offshore:** See Section 3.19.2.3.1 for construction analysis. Similar to Alternatives C through F, Alternative G would include the same, or similar, operational and decommissioning noise-producing activities as those described for the Proposed Action but would be reduced based on the reduction in the number of WTGs and other operational elements. Thus, the impacts of operational and cumulative noise are also considered **negligible** to **minor** adverse.
Presence of structures	**Offshore**: The addition of up to 3,113 new offshore foundations in the GAA could increase sea turtle prey availability by creating new hard-bottom habitat, increasing pelagic productivity in local areas, or promoting	**Offshore**: Construction and installation of offshore structures would have temporary **negligible** to **minor** adverse effects on sea turtles, varying in significance by species, due to underwater noise impacts related to impact pile driving and noise and disturbance from associated vessel activity.	**Offshore**: Alternatives C through F would result in impacts to sea turtles associated with the presence of WTG and OSS foundations that are similar to those described for the Proposed Action, but those effects would be reduced in extent. This would reduce the extent of long-term impacts on benthic habitat, water flow, prey aggregation, and fishing activity. This would also reduce the extent of antcipated hydrodynamic and reef effects. But given the offsetting nature of anticipated effects, the differences between alternatives on sea turltes				**Offshore**: Similar to Alternatives C through F, Alternative G would result in impacts to sea turtles associated with the presence of WTG and OSS foundations that are similar to those described for the Proposed Action, but those effects would be reduced in extent. The overall

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
	fish aggregations at foundations (Bailey et al. 2014). In contrast, broadscale hydrodynamic impacts could alter zooplankton distribution and abundance and concentrate recreational and commercial fishing around foundations, which could indirectly increase the potential for sea turtle entanglement in both lines and nets. Therefore, associated effects of structures on sea turtles through potential reef effects, hydrodynamic impacts, and concentration of fishing would be **minor** adverse, offset by **minor** beneficial impacts to sea turtle species that benefit from reef effects.	Potential long-term, intermittent impacts could persist until decommissioning is complete and structures are removed. These O&M impacts would be **negligible** to **minor** adverse, offset by **minor** beneficial impacts to sea turtle species that benefit from reef effects. BOEM estimates a cumulative total of 3,190 offshore WTGs and OSS foundations for the Proposed Action plus all other future offshore wind projects in the GAA. For similar reasons as described above, the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in **negligible** to **minor** adverse cumulative impacts and potential **minor** beneficial cumulative impacts to sea turtles.	would be uncertain. As with the Proposed Action, the overall impact to sea turtles from the presence of structures is not expected to be biologically significant due to the patchy distribution of sea turtles within the RWF and RWEC. Indirect effects on the prey base of some sea turtle species (i.e., invertebrates) from the presence of structures would occur. Potential long-term, intermittent impacts would persist until decommissioning is complete and structures are removed. These impacts would be **negligible** to **minor** adverse, offset by **minor** beneficial impacts to sea turtle species that benefit from reef effects.				impact to sea turtles from the presence of structures is not expected to be biologically significant due to the patchy distribution of sea turtles within the RWF and RWEC. Indirect effects on the prey base of some sea turtle species (i.e., invertebrates) from the presence of structures would occur. Potential long-term, intermittent impacts would persist until decommissioning is complete and structures are removed. These impacts would be **negligible** to **minor** adverse, offset by **minor** beneficial impacts to sea turtle species that benefit from reef effects.
Vessel traffic	**Offshore**: Increased vessel traffic could result in sea turtle injury or mortality; however, the proportional increase in vessel traffic from baseline would be minimal. Despite the unlikely potential for individual fatalities, no population-level impacts on sea turtles are expected based on occurrence and potential exposure. Assuming other offshore wind projects employ similar minimization measures included in this Project (see Table F-1 in Appendix F), impacts would be further reduced and would be considered **negligible** to **minor** adverse.	**Offshore**: Vessel collisions with individual turtles could occur, resulting in mortalities. Because the abundance of sea turtles is anticipated to be generally low with patchy distribution, and the proportional increase in vessel traffic is also low, the number of sea turtles injured or killed by vessel strikes during Project construction would be low and would have negligible effects at the population level. Therefore, the potential effects of construction and decomissioning vessel collisions on sea turtles would be **minor** adverse. O&M vessel use would represent a minimal increase in regional vessel traffic over the life of a facility and the effects to sea turtles are expected to be **negligible** to **minor** adverse. An increase in vessel traffic poses an increased likelihood of collision-related injury and mortality relative to existing baseline conditions. Some sea turtles could be injured or killed as a result, but the number of individuals impacted is not likely to significantly increase the existing mortality rate from vessel strikes. Additionally, BOEM expects that similar EPMs would be included in future offshore wind projects, helping to minimize the vessel strike risk. Therefore, cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **minor** adverse; BOEM does not expect the viability of sea turtle populations to be affected.	**Offshore:** Alternative C to F would require the same types and number of construction O&M and decommissioning vessels producing the similar impacts to those described for the Proposed Action, but the number of vessel trips and overall duration of construction activity would be reduced. The risk of collisions, disturbance, and other associated effects on sea turtles would similarly be reduced consistent with the overall reduction in vessel trips required to construct each alternative configuration. Thus, vessel traffic associated with the RWF would be expected to increase less than those estimated for the Proposed Action. For the Proposed Action, Revolution Wind (Tech Environmental 2023) has estimated that Project O&M would involve up to four CTV and two SOV trips per month for wind farm O&M, or 2,280 vessel trips over the life of the Project. It can be assumed that Alternative D would require similar or slightly fewer vessel trips during O&M. Therefore, the potential effects of vessel collisions on sea turtles would be **minor** adverse for the life of the Project; BOEM does not expect the viability of sea turtle populations to be affected.				**Offshore:** Similar to Alternatives C through F, Alternative G would require the same types and number of construction, O&M, and decommissioning vessels producing similar impacts to those described for the Proposed Action, but the number of vessel trips and overall duration of construction activity would be reduced. The potential effects of vessel collisions on sea turtles would be **minor** adverse for the life of the Project; BOEM does not expect the viability of sea turtle populations to be affected.

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3.19.2.2 Alternative A: Impacts of the No Action Alternative on Sea Turtles

3.19.2.2.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for sea turtles (including search and rescue) (see Section 3.19.1) would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities and by permitted and constructed offshore wind COP projects within the sea turtles GAA. These IPFs are described and analyzed in Appendix E1.

3.19.2.2.2 Cumulative Impacts

This section discloses potential sea turtles impacts associated with future offshore wind development (without the Proposed Action). The cumulative impact analysis for the No Action Alternative for planned non-offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E1.

Offshore Activities and Facilities

<u>Accidental releases and discharges:</u> BOEM prohibits the discharge or disposal of solid debris into offshore waters during any activity associated with the construction and operation of offshore renewable energy facilities (30 CFR 585.105(a)). The USCG similarly prohibits the dumping of trash or debris capable of posing entanglement or ingestion risk (MARPOL, Annex V, Public Law 100−220 (101 Stat. 1458)). BOEM also requires applicants to develop spill response and containment plans to quickly address accidental spills of fuels, lubricants, and other contaminants. While marine vessels are an inherent source of accidental releases of trash, debris, and contaminants, these requirements would effectively avoid and minimize these impacts such that the resulting effects to sea turtles would be **negligible** adverse.

Trash or water quality contaminants could be accidentally released as a result of increased human activity associated with future offshore wind construction activities. All species of sea turtles have been documented ingesting plastic fragments (Bugoni et al. 2001; Hoarau et al. 2014; Nelms et al. 2016) and a variety of other anthropogenic waste (Tomás et al. 2002), likely mistaking debris for potential prey items (Schyuler et al. 2014). Ingesting trash or exposure to aquatic contaminants can be lethal to sea turtles. However, turtles may also be affected sublethally in a variety of ways, which could include experiencing depressed immune system function; poor body condition; and reduced growth rates, fecundity, and reproductive success (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). Sea turtles could additionally become entangled in debris, causing lethal or injurious impacts. Entanglement in lost fishing gear is a significant cause of mortality in both juvenile and adult sea turtles and was noted as a threat to recovery for multiple ESA-listed turtles in the marine environment (NMFS and USFWS 1991, 1992; NMFS et al. 2011). Based on a recent global review, 5.5% of encountered sea turtles were found to be entangled, and 90.6% of these were dead (Duncan et al. 2017). Lost or discarded fishing gear was associated with most of these entanglements, and many experts believed that these impacts could be causing population-level impacts in some areas. Aquatic contaminant exposure could also result in mortality, and sublethal effects could impact many of the species' physiological systems during all life stages (Bembenek-Bailey et al. 2019; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Furthermore, accidental releases could indirectly impact sea turtles by impacting prey species. However, all vessels would comply with USCG regulations, and wind farm construction projects would comply with additional BOEM requirements that would avoid and minimize accidental releases of trash or other debris. Therefore, potential accidental releases of trash or debris would not appreciably contribute to adverse impacts to sea turtles and would be **negligible** adverse.

Impacts to sea turtles from accidental spills and releases associated with ongoing future non–offshore wind activities are likely to increase over the next 30 years commensurate with increases in vessel traffic. Future offshore wind activities would contribute to this increased risk. A total of approximately 34 million gallons of coolants, fuels, oils, and lubricants could be stored within WTG foundations and OSSs across all projected offshore wind projects along the Atlantic Coast. A high-volume spill of toxic materials (fuels, lubricants, and other contaminants) could potentially injure or kill several individual sea turtles and adversely affect habitat suitability. Given that the affected habitats would be at or outside the northern limit of range of most species, the number of individuals impacted would be small relative to population size. In the unlikely event of a high-volume spill, impacts of this magnitude would constitute a moderate effect on sea turtles. BOEM anticipates that the likelihood of a major spill of petroleum products and other toxic substances during construction is very low (a 1 in 1,000 chance per year) due to vessel allisions, collisions, O&M activities, or weather events (Bejarano et al. 2013). WTGs and OSSs are generally self-contained and would not generate discharge. All future offshore wind projects would be required to comply with regulatory requirements related to the prevention and control of accidental spills administered by the USCG and the BSEE Oil spill response plans are required for each project and would provide for rapid spill response, clean-up, and other measures that would help to minimize potential impacts on affected resources. Given the low probability of a large spill event, impacts to sea turtles from this IPF are likely to be **negligible** adverse.

<u>Climate change:</u> Global climate change is an ongoing potential risk to sea turtles, although the associated impact mechanisms are complex, not fully understood, and difficult to predict with certainty. This is particularly true when considering how the effects of climate change may interact with other IPFs. Possible impacts to sea turtles due to climate change include increased storm severity and frequency; changes in nearshore habitat suitability caused by increased erosion from upland sources; exposure to disease; ocean acidification; and altered habitat, prey availability, ecology, and migration patterns (Hawkes et al. 2009).

However, some of these potential impacts could also contribute to potential benefits associated with the creation of artificial reef habitat and could represent an increasing impact over the life of the Project. The potential implications of these and other related environmental changes and how they interact with the effects of regional offshore wind development are complex and uncertain. For example, the distribution of leatherback sea turtles in the North Atlantic is shifting northward in response to changes in water temperature (McMahon and Hays 2006). Should this trend continue it could lead to increased interactions between this species and offshore wind farms on the mid-Atlantic OCS, potentially magnifying the impacts and benefits described above. Over time, climate change, in combination with coastal and offshore development, would alter existing habitats, potentially rendering some areas unsuitable for certain species and more suitable for others. As described in Section 3.19.1, sea turtle populations likely to be impacted by future offshore wind activities are stable or generally increasing from historic lows. Therefore, potential climate change impacts would be **minor** adverse.

<u>Noise:</u> Under the No Action Alternative, human activities would continue to generate underwater noise with the potential to affect sea turtles. Existing and future sources of anthropogenic underwater noise

include commercial, government and military, research, and recreational vessel activity; military sonar; geophysical surveys; and the development and operation of other wind energy projects on the OCS. Several wind energy projects could be developed between 2022 to 2030, and their construction periods could overlap, adding several new sources of underwater noise to baseline levels generated by vessel traffic. As discussed in Section 2.1.3, some projects could be constructed concurrently or could involve concurrent construction activities (e.g., impact pile driving) at two or more locations in proximity, creating the potential for larger and/or overlapping areas of underwater noise effects.

Existing and potential future anthropogenic noise sources generally fall into two categories: 1) impulsive noise, defined as the instantaneous change in sound pressure over a short period of time; and 2) non-impulsive noise, which could be intermittent or remain constant and stable over a given time period. Impulsive and non-impulsive noise sources associated with offshore wind projects are discussed in the sections below.

Impulsive noise: Existing and potential future sources of impulsive underwater noise in the GAA include impact pile driving used in nearshore and offshore construction activities and geological and geophysical surveys.

Sea turtles could experience any of the following three potential exposure scenarios under the No Action Alternative:

1. Concurrent exposure to noise from two or more impact hammers, operating within the same project or in adjacent projects
2. Non-concurrent exposure to noise from multiple pile-driving events within the same year
3. Exposure to two or more concurrent or non-concurrent pile-driving events over multiple years

The reader is referred to Section 3.15 for a discussion of these concurrent noise exposure scenarios.

Geological and geophysical surveys generate high-intensity impulsive sound with the potential to result in short-term and long-term impacts on sea turtles if they are present in the ensonified area. Offshore wind surveys typically involve HRG equipment, which can generate non-impulsive noise that is generally less intense than noise generated from other geological and geophysical survey methods. Potential impacts from HRG equipment include sub-bottom profilers (e.g., boomer and sparker categories of equipment) that could be audible to sea turtles.

None of the equipment being operated for these surveys that overlaps with the hearing range (30 Hz to 2 kHz) for sea turtles has source levels loud enough to result in PTS or TTS based on the peak or cumulative exposure criteria. Therefore, physical effects are extremely unlikely to occur. Sea turtles could exhibit a behavioral response when exposed to received levels of 175 dB re 1 µPa (rms), and some HRG is within their hearing range (below 2 kHz). For boomers and bubble guns, the distance to this threshold is 40 m, and is 90 m for sparkers. Thus, a sea turtle would need to be within 90 m of the source to be exposed to potentially disturbing levels of noise. We expect that sea turtles would react to this exposure by swimming away from the sound source; this would limit exposure to a short time period—just the few seconds it would take an individual to swim away to avoid the noise. The risk of exposure to potentially disturbing levels of noise is reduced by the use of PSOs to monitor for sea turtles. At the start of a survey, equipment cannot be turned on until the exclusion zone is clear for at least 30 minutes. This condition is expected to reduce the potential for sea turtles nearby to be exposed to noise that could be disturbing.

However, even in the event that a sea turtle is submerged and not seen by the PSO, in the worst case, it is expected that sea turtles would avoid the area ensonified by the survey equipment that they can perceive. Because the area where increased underwater noise would be experienced is transient and increased underwater noise would only be experienced in a particular area for only seconds, BOEM expects any effects to behavior to be minor and limited to a temporary disruption of normal behaviors, temporary avoidance of the ensonified area, and minor additional energy expenditure spent while swimming away from the noisy area. If foraging or migrations are disrupted, BOEM expects that they would quickly resume once the survey vessel has left the area. No sea turtles would be displaced from a particular area for more than a few minutes. While the movements of individual sea turtles would be affected by the sound associated with the survey, these effects would be temporary (seconds to minutes) and localized (avoiding an area no larger than 90 m), and there would be only a minor and temporary impact on foraging, migrating, or resting sea turtles as the vessel continues along a survey line. Effects to individual sea turtles from brief exposure to potentially disturbing levels of noise are expected to be minor and limited to a brief startle, a short increase in swimming speed, and/or short displacement and would be so small that they cannot be meaningfully measured, detected, or evaluated; therefore, effects are negligible.

BOEM has concluded that disturbance of sea turtles from underwater noise generated by site characterization and site assessment activities would likely result in temporary displacement and other behavioral or nonbiologically significant physiological consequences (i.e., no injury or mortality would occur), and impacts on sea turtles would be negligible adverse.

Impulsive underwater noise from impact pile driving during planned offshore wind development, due to the anticipated frequency and spatial extent of effects, represents the highest likelihood for exposure of individual sea turtles to adverse impacts from noise. Although these potential impacts are acknowledged, their potential extent and magnitude is unclear because sea turtle sensitivity and behavioral responses to underwater noise are a subject of ongoing study. Potential behavioral impacts could include altered submergence patterns, temporary disturbance, startle response (diving or swimming away), and temporary displacement of feeding/migrating and a temporary stress response, if present within the ensonified area (NSF and USGS 2011; Samuel et al. 2005). The accumulated stress and energetic costs of avoiding repeated exposure to pile-driving noise over a season or a life stage could have long-term impacts on survival and fitness (Navy 2018). Conversely, sea turtles could become habituated to repeated noise exposure over time and not suffer any long-term consequences (O'Hara and Wilcox 1990; Hazel et al. 2007). This type of noise habituation has been demonstrated even when the repeated exposures were separated by several days (Bartol and Bartol 2011; Navy 2018).

Sea turtles that are close to impact pile driving could experience a temporary or permanent loss of hearing sensitivity. In theory, reduced hearing sensitivity could limit the ability to detect predators and prey or find potential mates, reducing the survival and fitness of affected individuals. However, the role and importance of hearing in these biological functions for sea turtles remain poorly understood (Lavender et al. 2014). Impacts to sea turtles from construction-related noise would likely be limited to minor or moderate short-term impacts on a small number of individuals. These short-term impacts on individuals are not expected to result in population-level effects; the effects of impulsive noise on sea turtles would therefore be **minor** adverse overall.

Non-impulsive noise: Non-impulsive underwater noise sources in the GAA include baseline noise levels from activities not regulated by BOEM, such as commercial, military and government, research, and recreational vessel traffic; aircraft; and offshore development activities. The planned development of other wind energy facilities would contribute additional new sources of intermittent non-impulsive underwater noise, including helicopters and fixed-wing aircraft, construction and O&M vessels, and vibratory pile driving during construction. Operational noise from WTGs would constitute a low-level, non-impulsive underwater noise source throughout the life of a given project.

Helicopters and fixed-wing aircraft could be used during initial site surveys, protected species monitoring prior to and during construction, and facility monitoring. Sea turtle responses to aircraft noise and disturbance is not well documented. Bevan et al. (2018) observed no evident behavioral responses from sea turtles exposed to drones flown directly overhead at altitudes ranging from 60 to 100 feet. Helicopters and aircraft would operate at altitudes of 1,000 feet or more except when helicopters are landing or departing from service vessels. In development of American National Standards Institute (ANSI) guidelines for fishes and sea turtles, Popper et al. (2014) did not consider aircraft noise because it was not considered to pose a great risk. Based on this information, cumulative effects on sea turtles from aircraft used for wind energy development on the OCS would be expected to be negligible.

Vibratory pile driving used during submarine cable construction is the most intensive source of intermittent, non-impulsive underwater noise expected to result from planned offshore wind energy development. Vibratory pile-driving noise can exceed levels associated with behavioral disturbance in sea turtles but only within a short distance (i.e., less than 200 feet) from the source. Given this low exposure probability to vibratory pile-driving noise and the fact that vibratory pile-driving activities would be limited in extent, temporary in duration, and widely separated, vibratory pile-driving noise effects on sea turtles would be negligible adverse.

Construction and operational vessels are the most broadly distributed source of intermittent non-impulsive noise associated with offshore wind projects. Sea turtle exposure to underwater vessel noise would correspondingly increase as a result of planned offshore wind projects, especially during construction periods. Applying vessel activity estimates developed by BOEM 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), vessel activity could peak in 2025, with as many as 210 vessels involved in the construction of reasonably foreseeable projects (see Section 2.1.3 for details). However, this increase must be considered relative to the baseline level of vessel traffic. The relatively low frequency range of turtle hearing (100–1,200 Hz) (Ketten and Bartol 2006; Lavender et al. 2014) overlaps the broad frequency spectrum of intermittent non-impulsive noise produced by vessels (10–1,000 Hz). Sea turtles could respond to vessel approach and/or noise with a startle response and a temporary stress response (NSF and USGS 2011). Overall, impacts to sea turtles from vessel noise would be negligible. Although sea turtles could become habituated to repeated noise exposure over time (Hazel et al. 2007), vessel noise effects for other wind farm development projects are expected to be broadly similar to noise levels from existing vessel traffic in the region. Nonetheless, periodic localized, intermittent, and temporary behavioral impacts on sea turtles could occur. Underwater noise generated by construction vessels would not exceed injury thresholds for turtles, as noise levels produced by vessels in general are below levels that could cause potential auditory threshold shifts. Behavioral responses to vessels have been reported but are thought to be more associated with visual cues, as opposed to auditory cues (Hazel et al. 2007), although both senses likely play a role in avoidance. A conservative assumption is that construction and support vessels could elicit behavioral changes in individual sea turtles near the vessels. It is assumed that these behavioral changes would be limited to evasive maneuvers such as diving, changes in swimming direction, or changes in swimming speed to distance themselves from vessels. Based on sea turtle responses to other types of disturbance (e.g., Bevan et al. 2018), turtle behavior is expected to return to normal when vessel noise dissipates. Given limited turtle sensitivity to underwater noise produced by vessels, the short-term nature of any behavioral responses, and the patchy distribution of sea turtles in the GAA, the effects of vessel noise from future activities on sea turtles would be negligible adverse.

Tougaard et al. (2020) summarized available monitoring data on wind farm operational noise, including both older generation geared turbine designs and quieter modern direct-drive systems like those proposed for the RWF. They determined that operating turbines produce underwater noise on the order of 110 to 125 dB_{RMS}, occasionally reaching as high as 128 dB_{RMS}, in the 10-Hz to 8-kHz range. This is consistent with the noise levels observed at the BIWF (110 to 125 dB re 1 µPa SPL rms) (Elliot et al. 2019) and the range of values observed at European wind farms and is therefore representative of the range of operational noise levels likely to occur from future wind energy projects. Sea turtle hearing is largely within the frequency range (< 1,200 Hz) for operational wind turbines; therefore, it is possible that wind turbine noise could be heard by sea turtles, although behavioral responses are unlikely based on the established threshold (175 dB_{RMS} re 1 µPa). This indicates that operational noise effects from other future actions would likely be negligible adverse.

Overall, effects of non-impulsive noise on sea turtles would be **negligible** adverse because of the patchy distribution of sea turtles and limited likelihood of behavioral responses to expected noise levels.

Presence of structures: The addition of up to 3,088 new offshore foundations in the GAA could increase sea turtle prey availability by creating new hard-bottom habitat, increasing pelagic productivity in local areas, or promoting fish aggregations at foundations (Bailey et al. 2014). The artificial reefs created by these structures form biological hotspots that could support species range shifts and expansions and changes in biological community structure (Degraer et al. 2020; Methratta and Dardick 2019; Raoux et al. 2017). Section 3.13 discusses reef creation and altered water flow in detail. The significance of these ecological changes to sea turtles is unknown, but the biological productivity generated by reef effects could result in improved foraging opportunities for some species at project scales. For example, loggerhead turtles may benefit from the increased abundance of crustaceans and other prey species concentrated around offshore structures. On this basis, the presence of structures could produce permanent minor beneficial effects on sea turtles that would persist over the life of the Project.

In contrast, broadscale hydrodynamic impacts could alter zooplankton distribution and abundance (van Berkel et al. 2020). There is considerable uncertainty as to how these broader ecological changes would affect sea turtles in the future and how those changes will interact with other human-caused impacts. The effect of reef effects and hydrodynamic impacts on sea turtles and their habitats under the No Action Alternative could be adverse or beneficial, varying by species, and their extent and magnitude is unknown.

The presence of structures could also concentrate recreational and commercial fishing around foundations, which could indirectly increase the potential for sea turtle entanglement in both lines and nets (Gall and Thompson 2015; Nelms et al. 2016; Shigenaka et al. 2010). Entanglement in both lines and nets could lead to injury and mortality due to abrasions, loss of limbs, and increased drag, leading to reduced foraging efficiency and ability to avoid predators (Barreiros and Raykov 2014; Gregory 2009; Vegter et al. 2014). Between 2016 and 2018, 186 sea turtles were documented as hooked or entangled with recreational fishing gear (BOEM 2021a). Due to the high number of foundations in a given lease area, it is likely that recreational and for-hire fisheries would avoid overcrowding structures by dispersing effort across many WTG foundations. However, the risk of entanglement and hooking or ingestion of marine debris could slightly increase from recreational and for-hire fishing since both fishers and turtles may be attracted to the same areas.

If structures result in vessel displacement or gear shifts, the potential impact to sea turtles is uncertain. Increased risk would not be expected by vessel displacement due to the patchy distribution of sea turtles. However, it could result in a potential increase in the number of vertical lines in the water column if there is no commensurate reduction in fixed-gear types as compared to mobile gear. In such circumstances of a greater shift from mobile gear to fixed gear, there would be a potential increase in the number of vertical lines, resulting in an increased risk of sea turtle interactions with fishing gear. Therefore, associated effects of structures on sea turtles through potential reef effects, hydrodynamic impacts, and concentration of fishing would be **minor** adverse.

<u>Vessel traffic:</u> Vessel strike is an increasing concern for sea turtles. The percentage of loggerhead sea turtles stranded with injuries consistent with vessel strikes increased from approximately 10% in the 1980s to 20.5% in 2004, although an unknown number may have been struck postmortem (NMFS and USFWS 2007). Sea turtles are expected to be most susceptible to vessel collision in shelf waters, where they forage. Furthermore, they cannot reliably avoid being struck by vessels exceeding 2 knots (Hazel et al. 2007); typical vessel speeds in the GAA could exceed 10 knots. Up to 210 vessels associated with offshore wind development could be operating in the GAA during the peak construction period in 2025. Additional fishing vessels could also be present in the vicinity due to the expected increase in fish biomass around the WTG structures. Increased vessel traffic could result in sea turtle injury or mortality; however, the proportional increase in vessel traffic from baseline would be minimal (refer to Section 3.16 and COP Appendix R [DNV GL Energy USA, Inc. 2020]). Despite the unlikely potential for individual fatalities, no population-level impacts on sea turtles are expected based on occurrence and potential exposure. Assuming other offshore wind projects employ the same minimization measures included in this Project (see Table F-1 in Appendix F), impacts would be further reduced and would be considered **minor** adverse.

3.19.2.2.3 Conclusions

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and decommissioning would not occur; and potential impacts associated with the Project to sea turtles would not occur. However, ongoing and future activities would have continuing temporary to long-term impacts on sea turtles, primarily through, but not limited to, construction-related lighting, noise, habitat alternation, collision risk, and the artificial reef effect.

Based on the current science, BOEM anticipates that the impacts of ongoing activities, especially vessel traffic, commercial and recreational fisheries gear interaction, and climate change, would be **minor**. In addition to ongoing activities, reasonably foreseeable activities other than offshore wind development include increased vessel traffic; new submarine cables and pipelines; channel-deepening activities; and the installation of new towers, buoys, and piers. BOEM anticipates that the impacts of reasonably foreseeable activities other than offshore wind would be minor. BOEM expects that the combination of ongoing activities and reasonably foreseeable activities other than offshore wind development to result in minor impacts on sea turtles, driven primarily by increasing vessel traffic and interactions with commercial and recreational fisheries gear.

The combined impact-level criteria in Table 3.3-2 and Table 3.3-3 in Chapter 3 are used to characterize the combined effects of all IPFs likely to occur in the GAA under the No Action Alternative. BOEM anticipates that the impacts associated with future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would result in **minor** adverse impacts from construction and operational noise and exposure to vessel traffic and **minor** beneficial impacts to sea turtles from increased biological productivity created by reef effects. Those impacts would range from short term to long term in duration. Future offshore wind activities are expected to contribute considerably to several IPFs, the most prominent being the presence of structures—namely foundations, scour/cable protection, and pile-driving noise.

The No Action Alternative would forgo any monitoring that Revolution Wind has committed to perform, the result of which could provide an understanding of the effects of offshore wind development, benefit future management of sea turtles, and inform planning of other offshore developments. However, other ongoing and future surveys could provide similar data.

3.19.2.3 Alternative B: Impacts of the Proposed Action on Sea Turtles

3.19.2.3.1 Construction and Installation

Offshore Activities and Facilities

Construction impacts to sea turtles could occur from accidental releases and discharges, artificial lighting, seafloor disturbance, entrainment and impingement, underwater and airborne noise, vessel traffic (strikes and noise), and water quality degradation. The potential for these impacts to occur are discussed in detail by IPF.

<u>Accidental releases and discharges:</u> During construction of the RWF and RWEC, there could be a short-term risk of sanitary and other waste fluids or fuels and other petrochemicals accidentally entering the water. If sea turtles were to be exposed to an oil spill or a discharge of waste material, studies indicate that respiration, skin, some aspects of blood chemistry and composition, and salt gland function could be significantly impacted in exposed individuals (Vargo et al. 1986). Any nonroutine spills or accidental releases that could result in negligible and short-term impacts to surface water resources would be avoided or minimized through the implementation of the Project SPCC plan and other EPMs (see Table F-1 in Appendix F). Impacts on sea turtles from accidental spills or releases of pollutants are considered negligible because of the low probability of the risk and EPM implementation.

Trash and debris that enter the water represent a risk factor to sea turtles because the turtles could ingest or become entangled in debris, causing lethal or injurious impacts. Pollution (e.g., plastic) is often mistaken for food such as jellyfish and ingested, which can block intestinal tracts, causing injury or mortality. See Section 3.15.2 for additional debris and entanglement analysis. Personnel working offshore would receive training on sea turtle and marine debris awareness. Impacts on sea turtles from accidental deposits of trash or debris associated with RWF are considered minor because implementation of proposed EPMs would lower the probability of such risk.

BOEM prohibits the discharge or disposal of solid debris into offshore waters during any activity associated with the construction and operation of offshore energy facilities (30 CFR 585.105(a)). The USCG similarly prohibits the dumping of trash or debris capable of posing entanglement or ingestion risk (MARPOL, Annex V, Public Law 100−220 (101 Stat. 1458)). The Project would comply with these requirements (VHB 2023). Given these restrictions, the short-term impacts to sea turtles from trash and debris from the Project would be **negligible** adverse.

Construction vessels also pose a potential risk for Project-related accidental spills. As described in Section 3.21.2.2.1, the chance of a spill occurring due to vessel allisions or collisions would be low (once per 1,000 years). In the unlikely event an allision or collision involving Project vessels or components resulted in a high-volume spill, impacts on water quality would be minor to moderate adverse and temporary to long term, depending on the type and volume of material released and the specific conditions (e.g., depth, currents, weather conditions) at the location of the spill. Project EPMs, permit requirements, controls, and procedures would be implemented as part of the Project to reduce the potential or extent of offshore spills, thereby avoiding or minimizing impacts on water quality. Should a spill occur, response and containment procedures would limit the reach of the spill to a localized area, where changes to water quality would be detectable and would exceed water quality standards. Given the low potential for spills and minimal risk of exposure to small temporary spills, the risk from construction-related spills is **negligible** to **minor** adverse.

Noise: A temporary increase in underwater noise is the most likely construction-related factor that could impact sea turtles if they are present in the area during the time of RWF and offshore RWEC construction. Construction noise sources include impact and vibratory pile driving, UXO detonation, HRG surveys, construction vessels, and helicopters and fixed-wing aircraft.

The current literature and effect analysis guidance regarding sensitivity to underwater noise effects vary depending on the source. Popper et al. (2014) reviewed available data and suggested the threshold levels of 207 peak decibels (dB re 1 µPa) and 210 decibels referenced to the sum of cumulative pressure in micropascals squared, normalized to 1 second (dB re 1 $\mu Pa^2 s$) for injurious (i.e., hearing loss) underwater noise for sea turtles. These recommended criteria are for mortality and potential mortal injury. NMFS has considered injury onset for PTS (i.e., permanent hearing injury) beginning at 232 dB re 1 µPa and 204 dB re 1 $\mu Pa^2 s$ and TTS (i.e., a temporary and recoverable loss of hearing sensitivity) beginning at 226 peak dB re 1 µPa and 189 cumulative dB re 1 $\mu Pa^2 s$ (Navy 2017). Exposure modeling for the extent of injurious effects from impulsive underwater noise was completed by Kusel et al. (2023) using the Navy (2017) thresholds, including a behavioral response SPL threshold of 175 rms dB re 1 µPa. These thresholds apply to juvenile, subadult, and adult life stages.

Table 3.19-3 summarizes thresholds for underwater noise effects and the maximum distances to injurious and behavioral effects from construction-related underwater noise levels from construction-related activities, including impact pile driving (Kusel et al. 2023), UXO detonation (Hannay and Zykov 2022), and HRG surveys (LGL 2022). These effects are described in greater detail below.

Table 3.19-3. Distances to Sea Turtle Underwater Noise Injury and Behavioral Thresholds for Wind Turbine Generator and Offshore Substation Foundation Installation

Activity†	Number of Sites	Total Days	Noise Exposure Type	Exposure Threshold*,¥	Range of Threshold Distances (feet)‡
12-m WTG monopile foundation installation	100	33	Peak injury	232	–
			Cumulative injury	204	98–689
			Behavioral or TTS	175	1,903–2,920
15-m OSS monopile foundation installation	2	2	Peak injury	232	–
			Cumulative injury	204	0–820
			Behavioral or TTS	175	2,362–3,182
Temporary cofferdam installation	1	14	Cumulative injury	220	102
			Behavioral or TTS	189	175
UXO detonation	Undeter-mined€	Undeter-mined€	Peak injury	232	112–689
			Cumulative injury	204	207–1,699
			TTS	189	354–8,235
HRG surveys	10,779	248	Behavioral	189	0–300
Construction vessel operation	N/A	~730	Behavioral or TTS	189	–

* Peak injury thresholds are SPL in dB re 1 μPa; cumulative injury thresholds are frequency-weighted SEL in dB re 1 $\mu Pa^2 \cdot s$ based on 24 hours of continuous exposure. The peak injury threshold is not recommended for estimating risk of injury from UXO detonation (Hannay and Zykov 2022).

† Installation scenario for 12-m monopile is 10,740 strikes/pile at installation rate of three piles/day. Installation scenario for 15-m monopile is 11,563 strikes/pile at installation rate of one pile/day. All piles installed with a 4,000-kJ hammer with an attenuation system achieving 10 dB sound source reduction. Sound source scenario for UXOs assumes detonation of thirteen 1,000-pound explosives with 10 dB of sound source attenuation.

‡ Pile-driving values are maximum threshold distances modeled by Kusel et al. (2023) for winter conditions. UXO detonation values are the range of maximum distances modeled by Hannay and Zykov (2022) for 5- to 1,000-pound explosive devices. Both sets of values assume 10 dB of sound attenuation.

¥ Navy (2017)

€ The 16 UXOs identified as of February 2023, all within in the RWEC corridor, can be safely avoided by rerouting the cable route (Orsted 2023). However, additional devices could be identified prior to and during construction that cannot be safely avoided or relocated. Therefore, the need for UXO detonation cannot be entirely ruled out.

As shown in Table 3.19-3, impact pile driving and UXO detonation produce sufficient underwater noise to cause permanent hearing injury and behavioral effects on sea turtles. The combined impact area for pile driving is sufficiently large that the potential for hearing injury to some sea turtles cannot be discounted. As of February 2023, 16 UXOs have been identified in the RWEC corridor. Revolution Wind (Orsted 2023) has determined that all 16 devices can be safely avoided by shifting the cable route within the approved installation corridor without the need for detonation. However, it is possible that additional devices could be discovered in preconstruction surveys or during construction that cannot be avoided or safely relocated. BOEM has concluded that the need for UXO detonation cannot be entirely ruled out and therefore the potential effects of this activity on invertebrates are considered herein. UXO surveys completed to date have not identified any UXOs within the Lease Area or near the proposed foundation positions and have only identified UXOs within the RWEC corridor in state waters at the mouth of and outside Narragansett Bay (Revolution Wind 2022b). The locations where UXOs are most likely to be encountered are within the central portion of the RWF and on the RWEC corridor at the mouth and outside of Narragansett Bay (Ordtek, Inc. [Ordtek] 2021). Although to date there are no identified UXOs directly influencing the technical feasibility assessment of the foundation positions proposed in the RWF, the risk of emergent finds will continue to be a consideration in the continued design and refinement of the RWF. The extent and duration of exposure to potential injury-level effects from UXO detonation shown in Table 3.19-3 assumes the possible detonation of thirteen 1,000-pound devices. It is now understood that this is likely an overestimate and relatively small in comparison to pile driving. Even though it is improbable, should UXO detonation be required under the maximum impact scenario considered in this analysis, the risk of permanent hearing injury to sea turtles is relatively low.

Little is known about the role of sound perception in the sea turtle's typical activities. Although sea turtles have relatively unspecialized ears relative to other vertebrate species, their auditory organs appear to be specifically adapted to underwater hearing (Dow Piniak et al. 2012). Studies indicate that hearing in sea turtles is confined to lower frequencies, below 1,200 Hz, with the range of highest sensitivity between 100 and 700 Hz (Dow Piniak et al. 2012), with some variation between species (Bartol and Ketten 2006; Dow Piniak et al. 2012; Martin et al. 2012; Piniak et al. 2016). In captive enclosures and during NSF-funded at-sea seismic monitoring programs, sea turtles generally respond to seismic survey sound with behavioral changes such as startling, increasing swimming speed, and swimming away from and/or locally avoiding the source (McCauley et al. 2000; NSF and USGS 2011). The majority of pile-driving activities are expected to take place during daylight hours. However, pile driving could occur at any time during the night under specific circumstances,[3] and EPMs are incorporated to appropriately minimize the risks associated with this activity (see Appendix F). Sea turtles migrating through the area when pile driving occurs are expected to adjust their course to avoid the area where noise is elevated above 175 dB re 1 μPa. Depending on how close the individual is to the pile being driven, this could involve swimming a mile or more to avoid stressful noise levels. Such behavioral alterations could cause turtles to cease foraging or expend additional effort and energy avoiding the area. Presumably, turtles could continue foraging activities outside the area of elevated noise levels as adjacent habitat provides similar foraging opportunities. The sea turtle may experience physiological stress during this avoidance behavior, but this stressed state would be anticipated to dissipate over time once the turtle is outside the ensonified area. Either a temporary or permanent reduction in hearing sensitivity could be harmful for sea turtles, but the potential extent and magnitude is unclear because the role that hearing plays in sea turtle survival (e.g., for predator avoidance, prey capture, and navigation) is poorly understood (NSF and USGS 2011). The use of PSOs, exclusion and monitoring zones, and pile-driving soft start measures (see Table F-1 in Appendix F) would minimize the risk of sea turtle exposure to elevated underwater noise levels. PSO effectiveness will be enhanced using clearly defined requirements and guidance, including nighttime and low-visibility PSO protocols (see Appendix F). However, the efficacy of exclusion and monitoring zones

[3] Nighttime pile driving may be required under specific circumstances where foundation installation takes longer than anticipated and delaying installation until daylight could present risks to safety and/or structural stability.

would be less during periods of nighttime pile driving, potentially exposing more individuals to elevated underwater noise.

Foraging disruptions due to displacement would be temporary and are not expected to last longer than a few hours per day when pile driving occurs. This displacement would result in a relatively small energetic consequence that would not be expected to have long-term impacts on sea turtles. Construction activities could temporarily displace animals into areas that have a lower foraging quality or result in higher risk of interactions with ships or fishing gear. However, the duration of disturbance is limited to active pile driving, and displaced individuals are expected to have suitable foraging opportunities throughout the Lease Area outside the influence of noise disturbance. WTG and OSS monopile installation would require 1 to 4 hours of active pile driving per pile under typical circumstances, with difficult installations requiring up to 12 hours. The maximum installation rate for WTG installation is three piles per day. The installation rate for OSS monopiles is one per day.

Impact pile driving during construction is the loudest potential impulsive underwater noise source associated with the Project and would produce the most extensive effects. As discussed in Section 3.19.1.1, the potential significance of impulsive underwater noise is unclear because sea turtle sensitivity and behavioral responses to underwater noise are a subject of ongoing study. Potential behavioral impacts could include altered submergence patterns, temporary disturbance, startle response (diving or swimming away), and temporary displacement of feeding/migrating and a temporary stress response, if present within the ensonified area (NSF and USGS 2011; Samuel et al. 2005). The accumulated stress and energetic costs of avoiding repeated exposure to pile-driving noise over a season or life stage could have long-term impacts on survival and fitness (Navy 2018). Conversely, sea turtles could become habituated to repeated noise exposure over time and not suffer long-term consequences (O'Hara and Wilcox 1990). This type of noise habituation has been demonstrated even when the repeated exposures were separated by several days (Bartol and Bartol 2011; Navy 2018).

Kusel et al. (2023) developed estimates of the number of sea turtles that could be exposed to potential adverse noise-related effects from WTG and OSS foundation installation. They used a sophisticated exposure model to estimate the number of individuals by species that could be exposed to PTS, TTS, and other temporary physiological and behavioral effects from construction noise exposure. The analysis used a conservative construction schedule in which the WTG and OSS installation was concentrated during the highest density months for each species, with up to three piles per day for 30 days. Based on the established timing restrictions to protect marine mammal species (i.e., NARWs), construction would occur primarily during the summer months when sea turtles (especially loggerheads and leatherbacks) have a higher likelihood of being present. The density estimates supporting the analysis are therefore likely representative of densities when construction activities would occur. The exposure estimates presented in Table 3.19-4 assume a broadband attenuation of 10 dB and a Project construction duration of approximately 35 days, assuming an aggressive installation schedule of three WTG and one OSS foundations per day.

Hannay and Zykov (2022) used a similar model to estimate the threshold distances for PTS and TTS exposure from UXO detonation with 10 dB of sound attenuation. Turtles within 689 feet of UXO detonation could experience injury based on the threshold of 232 dB re 1 $\mu Pa^2 s$. Turtles within 1,699 feet exposed to multiple UXO detonations in a single day could experience accumulated injury from based on the 204 dB SEL dB re 1 $\mu Pa^2 s$. Turtles within 8,235 feet of UXO detonation could experience behavioral impacts based on the threshold of 189 dB re 1 µPa^{2}s. The UXO detonation plan would include the same or similar sound attenuation, PSOs, and site exclusion EPMs used for pile driving (see Table F-1, Appendix F) to avoid and minimize adverse impacts to sea turtles. These exposure estimates do not consider the benefits to sea turtles from avoiding accidental uncontrolled UXO detonations that could occur in the absence of the Project. Zykov (2022) developed an exposure model to estimate the number of individuals by species that could be exposed to PTS and TTS from UXO detonation. The exposure scenario for UXOs assumes that thirteen 1,000-pound devices would require detonation within the RWF and RWEC work areas and that the devices are distributed such that the exposure areas would not overlap. Zykov (2022) determined that less than one individual leatherback and less than one individual loggerhead sea turtle could be exposed to PTS or TTS effects from UXO detonation in the RWEC corridor, and none would be exposed to these effects from detonations in the RWF. No Kemp’s Ridley or green sea turtles are likely to be exposed to PTS or TTS effects in either area.

Table 3.19-4. Estimated Number of Sea Turtles Experiencing a Permanent Threshold Shift and Temporary Threshold Shift or Behavioral Effects from Construction-Related Impact Pile Driving

Species	Source	PTS Cumulative Sound Exposure (number of indivuals)	PTS from Peak Sound Pressure Exposure (number of indivuals)	TTS or Behavioral Effects (number of indivuals)	Effect Significance*
Kemp's ridley turtle	Impact pile driving	< 0.01	0	< 1	Negligible
	UXO detonation†	–	0	0	
Leatherback turtle	Impact pile driving	< 1	0	8	Minor
	UXO detonation†	–	< 1	0.8	
Loggerhead turtle	Impact pile driving	< 1	0	4	Minor
	UXO detonation†	–	< 1	0.7	
Green turtle ‡	Impact pile driving	< 0.01	0	< 1	Negligible
	UXO detonation†	–	0	0	

Source: Kusel et al. (2023), Zykov (2022)

Note: Modeled exposure estimates based on impact hammer installation of one hundred 12-m and two 15-m monopiles. Installation scenario assumes use of a noise attenuation system achieving 10-dB effectiveness. Values < 1 indicate a modeled exposure estimate of greater than 0 but less than 0.5 affected individual, which is considered a result of zero for regulatory purposes.

* See impact significance criteria definitions in Chapter 3, Table 3.3-2.

† Take estimates assume potential exposure to detonation of thirteen 1,000-pound devices in the RFW and RWEC.

‡ Kraus et al. (2016) did not observe any green sea turtles in the RI/MA WEA. Densities of Kemp's ridley sea turtles are used as a conservative estimate.

Sea turtles that are close to impact pile driving could experience a temporary or permanent loss of hearing sensitivity. However, the potential effects on sea turtles are reduced through the implementation of EPMs and additional minimization measures (see Appendix F), including PSOs, soft starts, and noise attenuation systems. Reduced hearing sensitivity could limit the ability to detect predators and prey or find potential mates, reducing the survival and fitness of affected individuals, but the role and importance of hearing in these biological functions for sea turtles remain poorly understood (Lavender et al. 2014). Based on the combination of minimization measures and the low numbers of sea turtles expected in the RWF and RWEC, impacts to sea turtles from impact pile driving are expected to be **negligible** to **minor** adverse.

Vibratory pile driving could be used to install cofferdams for the RWEC sea-to-shore transition at Quonset Point. Similar to the effects of the impulsive impact hammer, only minor impacts to sea turtles from vibratory pile driving are expected because of the combination of minimization measures used and the low densities of sea turtles in the RWF and RWEC. Noise from vibratory pile driving at the sea-to-shore transition would be constrained within the natural geography of Narragansett Bay. Vibratory pile-driving noise is unlikely to exceed recommended sea turtle injury thresholds and would only exceed behavioral thresholds within 175 feet of the source (Kusel et al. 2023). Given the limited spatial extent of these potential effects, sea turtles are more likely to respond to disturbance from construction vessels staging on-site before pile driving begins. This suggests that the potential for exposure to vibratory pile-driving noise is limited at best, with vessel noise and disturbance being the more likely source of potential behavioral effects.

HRG surveys use a combination of sonar-based methods to map shallow geophysical features. Up to 10,779 linear miles of preconstruction surveys would be conducted to support Project installation. The equipment is towed behind a moving survey vessel attached by an umbilical cable. HRG equipment operating at frequencies below 2,000 Hz (typically sub-bottom profilers) may be audible to sea turtles. Equipment such as echosounders and side-scan sonars operate at higher frequencies andwould be outside the hearing range of sea turtles,therefore having no effect on these species. The equipment only operates when the vessel is moving along a survey transect, meaning that the ensonified area is intermittent and constantly moving. BOEM (2021b) evaluated evaluated potential underwater noise effects on sea turtles from HRG surveys and concluded there is no possibility of PTS in sea turtles from HRG sound sources because of the brief and intermittent disturbances that a vessel could have on individuals. Some HRG survey noise sources would exceed the behavioral effects threshold up to 300 feet from the source, depending on the type of equipment used, but given the limited extent of potential noise effects and the EPMs used in this Project (e.g., soft start measures, shutdown procedures, protected species monitoring protocols, use of qualified and NOAA-approved PSOs, and noise attenuation systems), adverse impacts to sea turtles are unlikely to occur. While low-level behavioral exposures could occur, these would be limited in extent and temporary in duration (Kusel et al. 2023). Therefore, underwater noise impacts from HRG surveys are expected to be **minor** adverse.

The relatively low frequency range of turtle hearing (100–1,200 Hz) (Ketten and Bartol 2006; Lavender et al. 2014) overlaps the broad frequency spectrum of noise produced by vessels (10–1,000 Hz). Sea turtles could respond to vessel approach and/or noise with a startle response and a temporary stress response (NSF and USGS 2011). However, Hazel et al. (2007) suggested that turtles could habituate to vessel sounds in marine areas that experience regular vessel traffic. This could reduce the behavioral impacts of vessel noise but could increase the potential for vessel collision (refer to Vessel traffic below).

Underwater noise generated by construction vessels would not exceed injury thresholds for turtles, as noise levels produced by vessels in general are below levels that could cause potential auditory threshold shifts. Behavioral responses to vessels have been reported but are thought to be more associated with visual cues, as opposed to auditory cues (Hazel et al. 2007), although both senses likely play a role in avoidance. A conservative assumption is that construction and support vessels could elicit behavioral changes in individual sea turtles near the vessels. It is assumed that these behavioral changes would be limited to evasive maneuvers such as diving, changes in swimming direction, or changes in swimming speed to distance themselves from vessels. Overall, impacts to sea turtles from vessel noise would be **negligible** adverse.

Fixed-wing aircraft could be used during construction for marine mammal monitoring, and helicopters could be used for crew transport to and from construction vessels. Monitoring aircraft would operate at an altitude of 1,000 feet. Noise levels generated by helicopters and propeller-driven aircraft at this altitude range from 65 to 85 dBA (Behr and Reindel 2008; Brown and Sutherland 1980). Noise from crew transport helicopters would increase during approach and departure from vessel landing pads. Currently, no published studies describe the impacts of aircraft overflights on sea turtles, although anecdotal reports indicate that sea turtles respond to aircraft by diving (BOEM 2017). While helicopter traffic could cause some temporary non-biologically significant behavioral reactions, including startle responses (diving or swimming away), altered submergence patterns, and a temporary stress response (BOEM 2017; NSF and USGS 2011; Samuel et al. 2005), these brief responses would be expected to dissipate once the aircraft has left the area. The potential effects of aircraft noise and disturbance on sea turtles are therefore expected to be **negligible** adverse.

Overall, based on the limited likelihood of exposure and implementation of effective EPMs and minimization measures, the noise effects on sea turtles during construction would be **negligible** to **minor** adverse.

<u>Presence of structures:</u> Effects on sea turtles from the construction and installation of WTG and OSS foundations would result primarily from underwater noise impacts related to impact pile driving and noise and disturbance from associated vessel activity. These impacts are described under the applicable IPFs for each type of disturbance. Indirect effects on sea turtles, such as reduced availability of forage or prey, could also result from impacts on benthic habitat and invertebrate prey species. These effects, including the anticipated acreages of benthic habitat affected by the presence of structures, are described in Sections 3.6.2.2.1 and 3.6.2.3.1. While indirect effects to invertebrate prey resources would occur, these impacts are not likely to significantly affect the availability of prey and forage resources for sea turtles because of their broad resource base and the minimal anticipated adverse effect to invertebrates during the construction phase. Therefore, construction and installation of offshore structures would have temporary, **negligible** to **minor** adverse effects on sea turtles, varying in significance by species.

<u>Vessel traffic:</u> Changes in vessel traffic resulting from the Proposed Action are a potential source of adverse effects on sea turtles. Propeller and collision injuries from boats and ships are common in sea turtles and an identified source of mortality (Hazel et al. 2007; Shimada et al. 2017). Hazel et al. (2007) also reported that individuals may become habituated to repeated exposures over time, when not accompanied by an overt threat. Project construction vessels could collide with sea turtles, posing a temporary increase in the risk of injury or death to individual sea turtles. However, implementation of a range of EPMs to avoid vessel collisions (see Appendix F, Table F-1) are expected to minimize the risk of

collisions with sea turtles. These include adherence to NOAA guidance for collision avoidance and a combination of additional measures, including approved speed restrictions for all vessels within marine mammal SMAs and DMAs. All vessel crews would receive training to ensure these EPMs are fully implemented for vessels in transit. Once on station, the construction vessels either remain stationary when installing the monopiles and WTG/OSS equipment or move slowly (i.e., at less than 10 knots) when traveling between foundation locations. Cable laying and HRG survey vessels also move slowly, with typical operational speeds of less than 1 and approximately 4 knots, respectively.

Based on information provided by Revolution Wind (Tech Environmental 2023), BOEM estimates that Project construction would require up to 1,407 one-way trips by various classes of vessels between the RWF and regional ports in Rhode Island, Massachusetts, Connecticut, New Jersey, Virginia, and Maryland, as well as ports in Europe, over the 2-year construction period. This equates to approximately 59 trips per month, or 704 trips per year. Large construction vessels and barges would account for an estimated 23% of these one-way trips, with the remainder comprising CTVs and other small support vessels. The construction and installation vessels used for Project construction and installation are described in COP Tables 3.11, 3.12, and 10-3 and include jack-up WTG construction and installation vessels, foundation construction and installation vessels, supply vessels and feeder barges, bunkering vessels, cable-laying vessels, crew transport vessels, and various safety and support craft. Typical large construction and installation vessels used in this type of project range from 325 to 350 feet in length, from 60 to 100 feet in beam, and draft from 16 to 20 feet (Denes et al. 2021). Crew transport and various support vessels range in size from 20 to 100 feet. In addition, approximately 10,779 linear miles of preconstruction HRG surveys are anticipated to support micrositing of the WTG foundations and cable routes. HRG surveys could occur during any month of the year and would require a maximum of 248 total vessel days.

BOEM developed a representative analysis of construction vessel effects on regional traffic volume by evaluating the potential increase in transits across a set of analysis cross sections relative to baseline levels of vessel traffic. These cross sections were developed by DNV GL Energy USA, Inc. (2020) to support the COP and are shown in Figure 3.15-2. Using the port of origin information provided by Revolution Wind (Tech Environmental 2023), the estimated 704 construction vessel trips per year would cross transects 13-17 when leaving the RWF and could cross several different transects depending on the destination port. This would equate to a 30% increase in vessel transits across these transects. However, the Automatic Identification System (AIS) data used in transect analysis do not include many recreational vessels and virtually all commercial fishing vessels when actively fishing. These vessel types account for the vast majority of vessel activity. For example, DNV GL Energy USA, Inc. (2020) estimated over 19,000 one-way trips per year by commercial fishing vessels between the RWF and area ports. When these vessel trips are included, Project construction would result in a 3.1% increase in vessel transits per year across transects 13-17. In summary, this assessment indicates that construction vessels would likely increase vessel traffic to some degree, and large vessel traffic would measurably increase during the 2-year construction period. This indicates the potential for increased risk of sea turtle collisions in the absence of planned EPMs and other requirements.

Revolution Wind anticipates that up to 33 RWF construction vessel trips could originate from ports in the Gulf of Mexico. Although no specific ports have been identified for construction support, the travel distance from the Lease Area to the Gulf of Mexico region can be estimated from broad vessel traffic patterns observable in AIS data (BOEM et al. 2022). The minimum travel distance from the Lease Area to an observable area of traffic separation approximately 150 miles due west of Key West, Florida, is approximately 1,550 miles. Travel distance from this point to Gulf of Mexico non-local ports ranges from approximately 475 miles (to the Port of Mobile, Alabama) to 850 miles (to the Port of Corpus Christi, Texas). This equates to total travel distances ranging from 1,925 to 2,400 miles.

Sea turtles are likely to be most susceptible to vessel collision in coastal foraging areas crossed by construction vessels traveling between the RWF and offshore RWEC and area ports. Hazel et al. (2007) indicated that sea turtles may not be able to avoid being struck by vessels at speeds exceeding 2 knots, and collision risk increases with increasing vessel speed. Habituation to noise may also increase the risk of vessel collision. However, avoidance behaviors observed suggest that a turtle's ability to detect an approaching vessel is more dependent on vision than sound, although both may play a role in eliciting behavioral responses. Construction vessel speeds could periodically exceed 10 knots during transits to and from area ports, posing an increase in collision risk relative to baseline levels of vessel traffic. During construction, vessels generally either remain stationary when installing the monopiles and WTG/OSS equipment or move slowly (i.e., at less than 10 knots) when traveling between foundation locations. Cable-laying vessels move slowly, on the order of 3 to 30 miles per day, with a maximum speed of approximately 1.2 miles per hour. Project EPMs include the implementation of NOAA vessel guidelines (see Appendix F) for marine mammal and sea turtle strike avoidance measures, including vessel speed restrictions. Nevertheless, collisions with individual turtles could occur, resulting in mortalities. Because the abundance of sea turtles is anticipated to be generally low with patchy distribution, and the proportional increase in vessel traffic is also low, the number of sea turtles injured or killed by vessel strikes during Project construction would be low and would have negligible effects at the population level. Therefore, the potential effects of construction vessel collisions on sea turtles would be **minor** adverse.

3.19.2.3.2 Operations and Maintenance and Decommissioning

Offshore Activities and Facilities

<u>Accidental releases and discharges:</u> The RWF would undergo maintenance as needed, which would necessitate vessels and other equipment at the facility for the life of the Project. This presents an opportunity for accidental discharge or spills of fuels and/or fluids during maintenance activities. Spill response EPMs (see Table F-1 in Appendix F) employed during construction would be implemented during maintenance activities. These EPMs are expected to avoid or minimize water quality impacts from accidental spills or releases of pollutants during O&M activities. Impacts on sea turtles from accidental spills or releases of pollutants are considered **minor** adverse because of the low probability of the risk and EPMs (refer to Section 3.21 for additional details).

<u>Noise:</u> WTG operations, O&M and monitoring vessels, and postconstruction HRG surveys would generate underwater noise detectable by sea turtles. Tougaard et al. (2020) summarized available monitoring data on wind farm operational noise, including both older generation geared turbine designs and quieter modern direct-drive systems like those proposed for the RWF. They determined that operating turbines produce underwater noise on the order of 110 to 125 dB_{RMS}, occasionally reaching as high as 128 dB_{RMS}, in the 10-Hz to 8-kHz range. This is consistent with the noise levels observed at the BIWF (110 to 125 dB re 1 µPa SPL rms) (Elliot et al. 2019) and the range of values observed at European wind farms and is therefore representative of the range of operational noise levels likely to occur from future wind

energy projects. More recently, Stober and Thomsen (2021) used monitoring data and modeling to estimate operational noise from larger (10 MW) current generation direct-drive WTGs and concluded that these designs could generate higher operational noise levels than those reported in earlier research. This suggests that operational noise effects on sea turtles could be greater than those considered herein, but these findings have not been validated. The Project would generate operational noise throughout the life of the RWF. As noted previously, sea turtle hearing is largely within the frequency range (< 1,200 Hz) for operational wind turbines; therefore, it is possible that wind turbine noise could be heard by sea turtles, although behavioral responses are unlikely based on the established threshold.

Little is known currently about how sea turtles use hearing in their natural environment (Lavender et al. 2014); therefore, it is difficult to interpret the potential effects of long-term, non-impulsive noise generated by the WTGs. O'Hara and Wilcox (1990) reported that loggerheads avoid sources of low-frequency sound in the 25- to 1,000-Hz range. The sound levels produced during operation are less than the behavioral and injurious thresholds defined by NMFS for sea turtles. However, potential responses to underwater noise generated by WTG operation could include avoidance of the noise source. Operational noise levels would not cause injury to sea turtles but could alter the behavior of individuals close to the structure. Localized behavioral long-term effects from operational noise would be **negligible** adverse because of the limited likelihood of behavioral effects.

While sea turtles would likely be able to detect O&M vessels in the vicinity, this would not necessarily translate to biologically significant effects. For example, Hazel et al. (2007) concluded that sea turtles appear to be relatively insensitive to vessel noise, relying on their vision to detect approaching vessels. Sea turtles may respond to vessel approach and/or noise with a startle response (diving or swimming away) and a temporary stress response (NFS and USGS 2011). In contrast, Samuel et al. (2005) indicated that vessel noise can affect sea turtle behavior, especially their submergence patterns. BOEM anticipates that the potential effects of noise from O&M vessels would elicit brief responses to the passing vessel that would dissipate once the vessel or the turtle left the area. For these reasons, BOEM anticipates that sea turtle exposure to vessel noise would be minimal, and responses if any, would be temporary and biologically insignificant, with individuals returning to normal behaviors once the vessel has passed.

Up to 1,062 linear miles of postconstruction HRG surveys could be conducted each year for the first 4 years of Project operations to ensure transmission cables are maintaining desired burial depths. This equates to approximately 25 days of HRG survey activity per year. The related effects on sea turtles would be similar in nature to those described for construction-related HRG surveys in Section 3.19.2.2.1 but reduced in extent and duration. The limited behavioral responses to HRG survey equipment and vessels would be similar to those described above for general O&M vessel noise.

Project decommissioning would require the use of construction vessels of similar number and class as those used during construction. Underwater noise and disturbance levels generated during decommissioning would be similar to those described above for construction, with the exception that pile driving would not be required. The monopiles would be cut below the bed surface for removal using a cable saw or abrasive waterjet. Noise levels produced by this type of cutting equipment are generally indistinguishable from engine noise generated by the associated construction vessel (Pangerc et al. 2016). Therefore, this decommissioning equipment would not contribute to additional noise effects above and beyond those already considered for construction vessel noise. The short-term effects of Project decommissioning on sea turtles would therefore range from **negligible** to **minor** adverse.

Presence of structures: The WTG and OSS foundations, exposed portions of the offshore RWEC, and associated scour protection would result in a long-term conversion of existing complex and non-complex bottom habitat to new stable, hard surfaces. Once construction is complete, these surfaces would be available for colonization by sessile organisms and would draw species that are typically attracted to hard-bottom habitat (Causon and Gill 2018; Langhamer 2012). Refer to Section 3.6.2.2.2, 3.6.2.3.2, and 3.13.2.2 for a detailed overview of potential changes in food web dynamics caused by reef effects. Over time, this reef effect would increase the amount of forage and shelter available for sea turtles.

The WTG and OSS foundations constitute potential obstacles in the water column for the life of the Project until decommissioning. Given that sea turtles are highly mobile and the structures are only 36 to 45 feet in diameter and would be separated by approximately 1 mile, the structural alterations of the water column are unlikely to pose a direct barrier to foraging, migration, or other behaviors of sea turtles. However, the presence of WTG structures could indirectly affect sea turtles by potentially altering prey distribution or promoting fish aggregations and thus concentrating fishing vessels at the foundations. This range of potential impacts is discussed in the following paragraphs.

Human-made structures, especially tall, vertical structures like WTG and OSS foundations, may also alter local water flow at a fine scale and could result in localized impacts on sea turtle prey distribution and abundance. These localized effects typically dissipate within a relatively short distance from the structure (Miles et al. 2017); effects would likely dissipate within 300 to 400 feet of each monopile foundation. However, there is potential for regional impacts to wind wave energy, mixing regimes, and upwelling (van Berkel et al. 2020), and these changes in water flow caused by the presence of the WTG structures could influence sea turtle prey distribution at a broader spatial scale. The distribution of fish, invertebrates, and other marine organisms on the OCS is determined by the seasonal mixing of warm surface and cold bottom waters, which determines the primary productivity of the system (Chen et al. 2018; Lentz 2017; Matte and Waldhauer 1984). Although there is a high degree of uncertainty, the presence of WTG structures could affect conditions in ways that alter these dynamics, potentially increasing primary productivity near the structures by disrupting vertical stratification and bringing nutrient-rich waters to the surface (Carpenter et al. 2016; Schultze et al. 2020a). However, this increase in primary productivity may not translate to a beneficial increase in sea turtle prey abundance if the increased productivity is consumed by filter feeders, such as mussels, that colonize the surface of the structures (Slavik et al. 2019). Considering the largely localized nature of potential effects to primary production surrounding WTGs (van Berkel et al. 2020), the likelihood of broader benefits for sea turtles is minimal.

The overall effects of offshore structure development on ocean productivity, sea turtle prey species, and, therefore, sea turtles, are difficult to predict with certainty and are expected to vary by location, season, and year, depending on broader ecosystem dynamics. The addition of up to 102 new offshore foundations could increase sea turtle prey availability by creating new hard-bottom habitat, increasing pelagic productivity in local areas, or promoting fish aggregations at foundations (Bailey et al. 2014). These aterations may increase foraging opportunities for loggerhead and Kemp’s ridley sea turtles with preferences for more bottom-dwelling invertebrate prey. Increased primary and secondary productivity in proximity to structures could also increase the abundance of jellyfish, a prey species for leatherback sea turtles (English et al. 2017; NMFS and USFWS 1992). The artificial reefs created by these structures form biological hotspots that could support species range shifts and expansions and changes in biological community structure (Degraer et al. 2020; Methratta and Dardick 2019; Raoux et al. 2017).

In contrast, broadscale hydrodynamic impacts could lead to localized changes in zooplankton distribution and abundance (van Berkel et al. 2020). A growing body of research has demonstrated that offshore wind farms could have observable effects on oceanographic conditions at scales ranging to tens of miles down field from wind farm sites (e.g., Christiansen et al. 2022; Daewel et al. n.d. [2023]; Dorell et al. 2022; Floeter et al. 2022; Raghukumar et al. 2022), although the extent of these effects and the resulting significance on biological processes are likely to vary considerably between different oceanographic environments (van Berkel et al. 2020). Van Berkel et al. (2020) and Schultze et al. (2020b) note that environments characterized by strong seasonal stratification, such as the Mid-Atlantic Bight, are likely to be less sensitive to changes and disruptions to oceanographic processes from wind farm effects. As discussed in Section 3.6.2.3.2, hydrodynamic modeling conducted by Johnson et al. (2021) indicated project-related shifts in larval transport and settlement density, but these shifts are not expected to have broad-scale impacts on invertebrate populations. There is considerable uncertainty as to how these localized ecological changes would affect sea turtles and how those changes would interact with other human-caused impacts. The effect of these IPFs on sea turtles and their habitats could be positive or negative, varying by species, and their extent and magnitude is unknown. Recent studies have also found increased biomass for benthic fish and invertebrates, and possibly for pelagic fish, sea turtles, and birds, around offshore wind facilities (Pezy et al. 2018; Raoux et al. 2017; Wang et al. 2019), translating to potential increased foraging opportunities for sea turtle species. However, an increase in biomass could result in limited benefits to higher trophic levels, depending on species composition and prey preferences (Pezy et al. 2018).

Increased fish biomass around the structures could also attract commercial and recreational fishing activity, creating an elevated risk of injury or death from gear entanglement and ingestion of debris (Barreiros and Raykov 2014; Gregory 2009; Vegter et al. 2014). As noted above, lost/discarded fishing gear was associated with a majority of sea turtle entanglements in a global review (Duncan et al. 2017). However, through implementation of EPMs related to management of debris surrounding the WTGs (see Table FF-1 in Appendix FF), the increase in entanglement risk is expected to be minimal.

The presence of structures could result in multiple types of impacts, with potentially opposing outcomes for sea turtles. The presence of structures could indirectly concentrate recreational fishing around foundations, which could indirectly increase the potential for sea turtle ingestion of or entanglement in lines, nets, and other lost or discarded fishing gear (Gall and Thompson 2015; Nelms et al. 2016; Shigenaka et al. 2010). However, the addition of structures could benefit sea turtles by locally increasing pelagic productivity and prey availability for sea turtles. The overall impact to sea turtles is not expected to be biologically significant due to the patchy distribution of sea turtles in the northern portion of the GAA where the RWF and RWEC are located. Potential long-term, intermittent impacts could persist until decommissioning is complete and structures are removed. These impacts would be **negligible** to **minor** adverse, offset by **minor** beneficial impacts to sea turtle species that benefit from reef effects.

Decommissioning would remove the structures from the water column and effectively eliminate any operational effects of the presence of structures. No specific methods for decommissioning and removal of structures have been proposed, as the planned removal would occur at the end of the Project lifetime. The COP provides no indication that decommissioning would involve lines, rigging, or other equipment that could pose a potential entanglement risk to sea turtles. The Project would develop a decommissioning plan that specifies the methods and equipment proposed for structure removal. That plan would be subject to independent environmental compliance and regulatory review.

Vessel traffic: Revolution Wind (Tech Environmental 2023) has estimated that Project O&M would involve up to one CTV trip each week and one SOV trip every other week to the RWF over the life of the Project. CTV trips shared between the RWF and other offshore energy projects and daughter craft activity could account for an additional 23 vessel trips per year. In total, Project O&M would require an estimated 3,030 vessel trips over the life of the Project. These trips would originate either from an O&M facility located either in Montauk, New York, or Davisville, Rhode Island. One or more CTVs ranging from 62 to 95 feet in length would be purpose built to service the RWF over the life of the Project. SOVs are larger mobile work platforms, on the order of 215 to 305 feet long and 60 feet in beam, equipped with dynamic positioning systems used for more extensive, multiday maintenance activities (Ulstein 2021). Larger vessels similar to those used for construction could be required for unplanned maintenance, such as repairing scour protection or replacing damaged WTGs. Those activities would occur on an as-needed basis. Additional vessel trips would be required over the life of the Project forseafloor surveys and subsurface inspections. A minimum of three postconstruction seafloor bathymetry surveys would be conducted to assess foundation scour and correct if needed. Project fishery monitoring and benthic habitat monitoring surveys would also be conducted annually, as discussed above. Vessels used would be similar to those used for preconstruction HRG surveys.

In general, O&M-related vessel activities would represent a small increase in regional vessel traffic compared to existing conditions. Project O&M could involve up to 10 one-way vessel trips between the RWF and O&M facility or other area ports each month. By comparison, hundreds of large vessels and thousands of smaller vessels, many of the latter comparable in size to a CTV, travel through the areas between the wind farm and proposed O&M facility locations each month (Section 3.15.2.2.1). O&M vessel use would therefore represent a minimal increase in regional vessel traffic over the life of a facility and the effects to sea turtles are expected to be negligible adverse.

As detailed in Appendix F, all survey vessels would comply with speed restrictions and other minimization measures to minimize risk of collision with sea turtles, making the risk of vessel strikes from Project monitoring vessels unlikely. As described in the previous section, the applicant has voluntarily committed to specific EPMs, including vessel timing and speed restrictions, to avoid and minimize vessel-related risks to sea turtles (see Appendix F, Table F-1). Based on the generally low density of sea turtles in the Lease Area and the anticipated vessel trips during operations, there is a low risk of encountering a sea turtle. The operational conditions combined with planned EPMs (see Appendix F for all vessel strike avoidance measures) would minimize collision risk during construction and installation. During periods of low visibility, trained crew would use increased vigilance to avoid sea turtles. Because vessel strikes are not an anticipated outcome given the relatively low number of vessel trips and implementation of effective monitoring and EPMs. BOEM concludes vessel strikes have a low probability of occurrence and therefore would have a minor anticipated effect on sea turtles. In the unlikely event of a sea turtle strike by any vessel supporting the Project, Revolution Wind must immediately cease the activities until BOEM is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with all applicable laws (e.g., ESA) and COP approval conditions.

As with construction, a similar increase in vessel round trips during decommissioning is expected to increase the relative risk of vessel strike for sea turtles. The implementation of NOAA guidelines (see Appendix F) as an EPM is intended to minimize the potential of vessel strikes for sea turtles by reducing vessel speed and maintaining a separation distance from sighted turtles. Collisions, if they do occur, are expected to be fatal to individuals. Because the abundance of sea turtles in the RWF and RWEC is anticipated to be generally low with patchy distribution, and the proportional increase in vessel traffic is also low, the number of sea turtles injured or killed by vessel strikes as a result of Project decommissioning would be low and would have negligible effects at the population level. Therefore, potential effects of vessel strikes on sea turtles from vessels supporting Project decommissioning would be minor adverse. Overall, the anticipated effect to sea turtles from vessel traffic associated with O&M and decommissioning would be **minor** adverse.

3.19.2.3.3 Cumulative Impacts

Offshore Activities and Facilities

Accidental releases and discharges: Toxic contaminants and marine debris are recognized as significant sources of sea turtle injury and mortality and are leading threats to successful species conservation and recovery. The Proposed Action would increase commercial vessel activity on the OCS, creating a potential source for accidental spills, trash, and debris. BOEM estimates that the Project would result in a negligible, up to a 2% increase in total chemical usage in the GAA relative to the No Action Alternative. When combined with other offshore wind projects, up to approximately 34 million gallons of coolants, oils, fuels, and lubricants could cumulatively be stored within WTG foundations and the OSS within the GAA. Compliance with USCG regulations and BOEM requirements to minimize the risk of accidental spills and/or release of trash and debris would limit the volume and extent of Project-related trash/debris or invasive species potentially released accidentally. Additionally, as discussed in Section 3.19.1.1, the volumes of trash/debris potentially released accidentally under the No Action Alternative would be negligible and would not contribute to potential adverse impacts. Therefore, cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **negligible** to **minor** adverse because of the regulatory protections and limited likelihood of sea turtle exposure.

Climate change: The types of impacts from global climate change described for the No Action Alternative would occur under the Proposed Action, but the Proposed Action could also contribute to a long-term net decrease in GHG emissions. As described in Section 3.19.1.1, the interactions between climate change and other potential impacts associated with the Proposed Action are complex and difficult to predict with certainty. Northward shifts in sea turtle distributions due to warming waters could result in magnification of the anticipated impacts due to increased exposure. However, this magnification includes potential benefits associated with the creation of artificial reef habitat and could represent an increasing impact over the life of the Project. Based on the potential for increased exposure to the various effects of the Proposed Action described above, the Proposed Action when combined with other past, present, and reasonably foreseeable actions is expected to result in **minor** adverse cumulative impacts to sea turtles due to the anticipated shifts in distributions.

Noise: The Proposed Action would result in localized, temporary, negligible to minor impacts to sea turtles through the generation of impulsive and non-impulsive underwater noise associated with offshore wind construction activities. BOEM estimates a cumulative total of 3,190 offshore WTGs and OSS foundations could be developed in the GAA for sea turtles between 2022 and 2030. Sea turtles are anticipated to occur at generally low densities (see Section 3.19.1) near wind farms in the region, reducing the probability of individual exposure to noise effects. Noise sources associated with the

Proposed Action could add to the ambient noise environment under the No Action Alternative if noise sources overlap temporally or geographically. Pile driving would represent the most significant source of noise. As noted in Section 3.19.1.1, there are three possible exposure scenarios for pile-driving noise: 1) concurrent exposure from two or more impact hammers for the same or adjacent projects; 2) non-concurrent exposure from multiple pile-driving events in the same years; 3) exposure to concurrent and non-concurrent pile-driving events over multiple years. Although the extent, duration, and magnitude of exposure would vary based on Project -specific factors, the effects would be similar in nature to those described for the Proposed Action. Although exposure to pile-driving noise could disrupt behaviors of individual sea turtles, it is not expected to impair essential behavioral patterns. This is due to the temporary, localized nature of the effects and because normal behaviors are expected to resume once the sea turtle is no longer exposed to the noise. Permanent hearing impairment could occur to some individuals, but science has not determined whether changes in hearing ability would negatively impact the ability of sea turtles to feed, navigate, find suitable habitats, and reproduce. Due to the limited information about noise-related stress responses in sea turtles, physiological stress responses may likely occur concurrently with any other response, such as hearing impairment or behavioral disruptions.

For impulsive noise, BOEM anticipates that projects would employ soft starts during pile driving to allow the small number of turtles in the region to leave the area before underwater noise increases to injurious levels. Additionally, the implementation of sound attenuation systems, PSO exclusion and shutdown zones, and other planned EPMs (see Appendix F) would further reduce the likelihood of injury from the potential moderate cumulative impacts associated with pile driving. Vibratory pile driving associated with the sea-to-shore transition would create non-impulsive underwater noise, but similar to the effects of the impulsive impact hammer, only minor impacts to sea turtles are expected because of the combination of minimization measures used and the low densities of sea turtles in the RWF and RWEC. Potential behavioral effects are more likely to be related to vessel noise and disturbance than the vibratory pile driving itself.

With regard to other non-impulsive noise sources, potential behavioral impacts on sea turtles from vessel traffic noise would be intermittent and temporary as animals and vessels pass near each other. During construction and operation, helicopter traffic could cause some temporary behavioral reactions in sea turtles, but energy expenditures would be minimal.

Based on the above findings, noise-related impacts of the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in **negligible** to **minor** adverse cumulative impacts to sea turtles, depending upon the noise source.

<u>Presence of structures</u>: The Proposed Action would result in long-term negligible and minor beneficial impacts to sea turtles through the installation of 102 structures (100 WTGs and two OSSs) to conditions under the No Action Alternative. The installation of monopile foundations would alter the character of the ocean environment, and their presence could affect sea turtle behavior. Increased prey availability, attraction to structures, and/or displacement could occur as a result of the installation of WTG facilities. As described in Section 3.19.2.2.2, structures associated with offshore wind farms are expected to provide some level of reef effect and could benefit sea turtle foraging by creating new hard-bottom habitat, increasing pelagic productivity in local areas, or promoting prey aggregations on foundations.

Some level of displacement of sea turtles out of the Lease Area and into areas with a higher potential for interactions with ships or recreational or commercial fishing gear could occur, particularly during construction phases, when elevated underwater noise levels occur. These intermittent impacts would persist until decommissioning is complete and structures are removed. Impacts could occur as a result of increased interaction with fishing gear, although annual monitoring, reporting, and cleanup of fishing gear around the base of the WTGs would reduce the extent of these impacts.

BOEM estimates a cumulative total of 3,190 offshore WTGs and OSS foundations for the Proposed Action plus all other future offshore wind projects in the GAA. For similar reasons as described above, the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in **negligible** to **minor** adverse cumulative impacts and potential **minor** beneficial cumulative impacts to sea turtles.

Vessel traffic: The Proposed Action would result in minor impacts to sea turtles through the addition of construction and maintenance vessels within the GAA. This increased offshore wind-related vessel traffic during construction, and associated noise impacts, could result in localized, intermittent impacts on sea turtles, resulting in brief minor behavioral responses that would be expected to dissipate once the vessel or the individual has left the area. However, BOEM expects that these brief responses of individuals to passing vessels would be unexpected given the patchy distribution of sea turtles; no stock- or population-level effects would be expected. Additionally, the Proposed Action would implement EPMs (see Table F-1 in Appendix F) to minimize vessel strikes.

BOEM estimates a peak of 262 vessels supporting offshore wind development will be operating in the GAA over the next decade, of which up to 59 would be associated with the Proposed Action construction and six would be associated with O&M. This increase in vessel traffic poses an increased likelihood of collision-related injury and mortality relative to existing baseline conditions. Some sea turtlescould be injured or killed as a result, but the number of individuals impacted is not likely to significantly increase the existing mortality rate from vessel strikes. Additionally, BOEM expects that similar EPMs will be included in future offshore wind projects, helping to minimize the vessel strike risk. Therefore, cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **minor** adverse; however, BOEM does not expect the viability of sea turtle populations to be affected.

3.19.2.3.4 Conclusions

Project construction and installation, O&M, and decommissioning would impact sea turtles through exposure to vessel traffic, underwater noise impacts, temporary habitat disturbance, and long-term habitat conversion. Individual sea turtles could be injured or killed by vessel collisions and underwater noise exposure during ProjectP construction, but the exposure risk is low and the number of individuals impacted would likely be small. Temporary habitat disturbance, including alteration of the seafloor and suspended sediment and burial effects, would be limited in extent and well below levels likely to have biologically significant effects on any sea turtle species. Reef effects created by the presence of offshore wind structures could beneficially increase foraging opportunities for species, such as loggerhead sea turtles, that forage on benthic crustaceans and other invertebrates.

On this basis, BOEM anticipates that the Proposed Action would result in **negligible** to **minor** adverse impacts to sea turtles, including **minor** beneficial impacts for species that are able to exploit the increased biological productivity created by reef effects on offshore wind structures. Overall, the impacts of the Proposed Action alone on sea turtles would likely be **minor** beneficial to **minor** adverse. Although some of the proposed activities and/or IPFs analyzed could overlap, BOEM does not anticipate that these combined effects would alter the overall significance determination because they would not alter impacts on any species to such a degree that measurable population-level effects would occur.

In the context of other reasonably foreseeable environmental trends and planned actions, the impacts under the Proposed Action resulting from individual IPFs would range from negligible to minor adverse and minor beneficial for some sea turtle species. The impact-level criteria are used to characterize effects of all IPFs. Applying these criteria, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **minor** adverse impacts on sea turtles in the GAA because unavoidable adverse impacts on individual sea turtles could occur that coincide with other adverse effects resulting from climate change, but those impacts are unlikely to measurably affect the viability of any sea turtle species at the population level.

3.19.2.4 Alternatives C, D, E, and F

3.19.2.4.1 Construction and Installation

Offshore Activities and Facilities

Noise: Construction of Alternatives C through F would result in similar underwater noise impacts on sea turtles from foundation installation to those described for the Proposed Action in Section 3.19.2.2.1, but those impacts would be reduced in extent and duration because fewer structures would be installed. This would reduce the number of days of impact pile driving required to construct the Project and the associated extent and duration of underwater noise. Reducing the number of structures would also reduce the required extent of HRG surveys under each alternative relative to the Proposed Action. Compared to the spatial and temporal extent of HRG surveys for the Proposed Action (10,779 miles over 248 days), the maximum extent of HRG surveys would be reduced for Alternative C (7,616 miles over 175 days), Alternative D (10,142 miles over 233 days), and Alternative E (8,846 miles over 204 days). Alternative F would be equivalent to any of the selected configurations of Alternatives C through E. The potential distribution of UXOs within the RWF is not currently known, but the largest devices are most likely to be encountered within the central portion of the RWF and in state waters on the RWEC corridor at the mouth of and outside of Narragansett Bay (Ordtek 2021). The RWEC configuration would remain the same across all alternatives, and the probable area of occurrence within the RWF is sufficiently large that it is not possible to determine how changes in alternative configuration would affect the likelihood of UXO encounters. Therefore, impacts to sea turtles from UXO detonation are considered to be the same across all alternatives.

Differences in the extent and duration for the Proposed Action and the different configurations proposed for Alternatives C through E are summarized in Tables 3.19-5, 3.19-6, and 3.19-7, respectively, based on the total number of WTG and OSS foundations requiring pile driving and underwater noise injury and behavioral effects thresholds. These tables display the number of structures installed and estimated days of pile-driving activity required to construct each alternative. As shown, while the extent and duration of potential noise exposure from impact pile-driving activities would vary between layouts, these effects would be similar in magnitude and general scale to the Proposed Action. Therefore, noise effects on sea turtles from the construction phase of each alternative would likewise vary by species and range from

negligible to **minor** adverse. The potential use of larger capacity WTGs under Alternative F could result in more extensive operational noise impacts than the Proposed Action, but insufficient information is available to characterize differences in effect.

Table 3.19-5. Comparison of Maximum Underwater Noise Injury and Behavioral Effects Exposure Extent and Duration (number of sites/days) to Sea Turtles from Revolution Wind Farm Foundation Installation for the Proposed Action and Proposed Configurations for Alternative C*

Exposure Type	Threshold Distance (feet)†	Proposed Action	C1	C2
Peak injury	–	100 sites/ 35 days	64 sites/ 22 days	65 sites/ 22 days
Cumulative injury	98–689			
Behavioral or TTS	1,903–2,920			

* Installation scenario for 12-m monopile is 6,500 strikes/pile at installation rate of three piles/day. All piles installed with a 4,000-kJ hammer with an attenuation system achieving 10 dB sound source reduction.

† Threshold distances are the distance in feet from the sound source where the identified type of exposure could occur. WTG values are the range threshold distances for monopile installation modeled by Kusel et al. (2023) across modeled sites and seasonal conditions.

Table 3.19-6. Comparison of Maximum Underwater Noise Injury and Behavioral Effects Exposure Extent and Duration (number of sites/days) for Sea Turtles from Revolution Wind Farm Foundation Installation for the Proposed Action and Proposed Configurations for Alternative D*

Exposure Type	Threshold Distance (feet)†	Proposed Action	D1	D1+D2	D1+D2+D3	D1+D3	D2	D2+D3	D3
Peak injury	–	100 sites/ 35 days	93 sites/ 31 days	92 sites/ 31 days	93 sites/ 31 days	85 sites/ 28 days	86 sites/ 29 days	85 sites/ 28 days	78 sites/ 26 days
Cumulative injury	98–689								
Behavioral	1,903–2,920								

* Installation scenario for 12-m monopile is 6,500 strikes/pile at installation rate of three piles/day. All piles installed with a 4,000-kJ hammer with an attenuation system achieving 10 dB sound source reduction.

† Threshold distances are the distance in feet from the sound source where the identified type of exposure could occur. WTG values are the range threshold distances for monopile installation modeled by Kusel et al. (2023) across modeled sites and seasonal conditions.

Table 3.19-7. Comparison of Maximum Underwater Noise Injury and Behavioral Effects Exposure Extent and Duration (number of sites/days) for Sea Turtles from Revolution Wind Farm Foundation Installation for the Proposed Action and Proposed Configurations for Alternative E*

Exposure Type	Threshold Distance (feet)†	Proposed Action	E1	E2
Peak injury	–	100 sites/5 days	64 sites/21 days	81 sites/27 days
Cumulative injury	98–689			
Behavioral	1,903–2,920			

* Installation scenario for 12-m monopile is 6,500 strikes/pile at installation rate of three piles/day. All piles installed with a 4,000-kJ hammer with an attenuation system achieving 10 dB sound source reduction.

† Threshold distances are the distance in feet from the sound source where the identified type of exposure could occur. WTG values are the range threshold distances for monopile installation modeled by Kusel et al. (2023) across modeled sites and seasonal conditions.

Presence of structures: The presence of WTG and OSS monopile foundations associated with Alternatives C through F would result in similar impacts to sea turtles as those described for the Proposed Action in Section 3.19.2.2.2, but those impacts would be reduced in extent and would vary depending on the alternative selected. Refer to the tables in Section 3.6.2.4.2 for a summary of the number of structures proposed by alternative and configuration. Impacts of the presence of structures are expected to be relative to the total number of structures proposed (i.e., fewer structures would result in a smaller extent of impacts).

As with the Proposed Action, the overall impact to sea turtles from the presence of structures is not expected to be biologically significant due to the patchy distribution of sea turtles within the RWF and RWEC. Impacts from the presence of structures are expected to vary in relation to the total number of foundations proposed (i.e., fewer structures would result in less extensive impacts). For example, both configurations of Alternative C and Alternative E1 propose noticeably fewer WTG and OSS foundations compared to the Proposed Action and most configurations of Alternative D. Therefore, these alternatives would be expected to produce noticeably reduced impacts from this IPF by comparison. In general, presence of structures effects on sea turtles under Alternatives C through F would likely be less extensive compared to those resulting from the Proposed Action. Reef effects would be reduced commensurate with the number of foundations constructed under each alternative configuration.

At present, insufficient information is available to determine if differences in Project configuration between alternatives, specifically where foundations are located relative to sensitive benthic habitats, would contribute to a measurable difference in reef effects on sea turtles beyond those resulting from a simple reduction in the number of structures. As stated in Section 3.15.2.2.3, hydrodynamic effects are likely to lead to localized changes in the distribution of planktonic organisms (e.g., jellyfish) for certain sea turtle species, but shifts in prey distribution on the order of miles to tens of miles are unlikely to be biologically significant for species that migrate thousands of miles between seasonal habitats every year. Increased biological productivity resulting from reef effects could concentrate recreational fishing around foundations, which could theoretically increase the potential for harmful interactions with fishing gear. However, these reef effects would also benefit certain sea turtle species by increasing and concentrating prey availability. Therefore, while Alternatives C through F would likely alter and reduce the extent of measurable reef and hydrodynamic effects relative to the Proposed Action, those effects are likely to remain biologically insignificant. Potential long-term intermittent impacts would persist until decommissioning is complete and structures are removed. These impacts would also be **negligible** to **minor** adverse, offset by **minor** beneficial impacts to sea turtle species that benefit from reef effects.

Vessel traffic: Construction of Alternatives C through F would result in a similar level of vessel traffic as the Proposed Action commensurate with the reduction in construction activities associated with fewer foundations and would vary depending on the alternative selected. An estimate of the reduced vessel trips per year associated with Alternatives C through F construction is not available; however, it is expected to be slightly less than the Proposed Action. Therefore, the potential effects of construction vessel collisions on sea turtles from each alternative would be **minor** adverse.

3.19.2.4.2 Cumulative Impacts

Offshore Activities and Facilities

The cumulative impacts analysis for Alternatives C, D, E, and F is provided in Table 3.19-2.

3.19.2.4.3 Conclusions

The construction and installation, O&M, and decommissioning of Alternatives C through F would impact sea turtles through the same IPFs described for the Proposed Action. These impacts include exposure to increased vessel traffic, underwater noise impacts from Project construction and O&M, temporary habitat disturbance, and long-term habitat conversion. These adverse impacts would be avoided and minimized using the same EPM's as described in the Proposed Action (see Table F-1 in Appendix F). Alternatives C through F would also generate similar beneficial reef effects but over a smaller area and with a reduced number of reef-forming structures. The resulting effects to sea turtles would therefore be similar to those described for the Proposed Action but reduced in extent and/or duration. However, the overall reduction in impacts would not be sufficient to alter the impact determinations for any sea turtle species. On this basis, BOEM concludes that Alternatives C through F would result in **minor** adverse effects to sea turtles, with those effects partially offset by **minor** beneficial impacts for some sea turtle species.

3.19.2.5 Alternative G: Impacts of the Preferred Alternative on Sea Turtles

3.19.2.5.1 Construction and Installation

Offshore Activities and Facilities

<u>Accidental releases and discharges:</u> Construction of Alternative G would result in a similar potential for accidental relaeases and discharges as the Proposed Action commensurate with the reduction in construction activities associated with 21 to 35 fewer foundations. Although expected to be slightly less than the Propsed Action, the risk from construction-related releases and discharges from Alternative G would be **negligible** to **minor** adverse.

<u>Noise:</u> Construction of Alternative G would result in similar underwater noise impacts on sea turtles from foundation installation to those described for the Proposed Action in Section 3.19.2.3.1, but those impacts would be reduced in extent and duration because 21 fewer structures would be installed. This would reduce the number of days of impact pile driving required to construct the Project and the associated extent and duration of underwater noise. The maximum extent of HRG surveys would be reduced (9,457 miles over 219 days) relative to the Proposed Action (10,779 miles over 248 days). The potential distribution of UXOs within the RWF is not currently known, but the largest devices are most likely to be encountered within the central portion of the RWF and in state waters on the RWEC corridor at the mouth of and outside Narragansett Bay (Ordtek 2021). The RWEC configuration would remain the same across all alternatives, and the probable area of occurrence within the RWF is sufficiently large that it is not possible to determine how changes in alternative configurations would affect the likelihood of UXO encounters. Therefore, impacts to sea turtles from UXO detonation are considered to be the same across all alternatives.

Differences in the number of sites and duration associated with foundation installation noise impacts between the Proposed Action and Alternative G are summarized in Table 3.6-8. These tables display the number of structures installed and estimated days of pile-driving activity required to construct each alternative. These effects would be roughly 35% less in magnitude and general scale to the Proposed Action. Therefore, noise effects on sea turtles from the construction phase of Alternative G would likewise vary by species and range from **negligible** to **minor** adverse.

Table 3.19-8. Comparison of Maximum Underwater Noise Injury and Behavioral Effects Exposure Extent and Duration (number of sites/days) to Sea Turtles from Revolution Wind Farm Wind Turbine Generator and Offshore Substation Foundation Installation under the Proposed Action and Alternative G*

Exposure Type	Threshold Distance (feet)†	Proposed Action	Alternative G	Alternatives G1–G3
Peak injury	–	102 sites/ 35 days	81 sites/ 28 days	67 sites/ 24 days
Cumulative injury	98–820			
Behavioral or TTS	1,903–2,920			

* Installation scenario for a 12-m monopile is 10,740 strikes/pile at an installation rate of three piles/day. Installation scenario for a 15-m monopile is 11,563 strikes/pile at an installation rate of up to two piles/day. All piles installed with a 4,000-kJ hammer with an attenuation system achieving 10 dB sound source reduction.

† Threshold distances are the distance in feet from the sound source where the identified type of exposure could occur. WTG values are the range threshold distances for monopile installation modeled by Kusel et al. (2023) across modeled sites and seasonal conditions. Maximum threshold distances for WTG and OSS monopiles are 689 and 820 feet, respectively.

Presence of structures: The presence of WTG and OSS monopile foundations associated with Alternative G would result in similar impacts to sea turtles as those described for the Proposed Action in Section 3.19.2.3.2, but those impacts would be reduced in extent because 35 fewer structures would be installed. Refer to the tables in Section 3.6.2.4.2 for a summary of the number of structures proposed by alternative and configuration. Impacts of the presence of structures are expected to be relative to the total number of structures proposed (i.e., fewer structures would result in a smaller extent of impacts).

As with the Proposed Action, the overall impact to sea turtles from the presence of structures is not expected to be biologically significant due to the patchy distribution of sea turtles within the RWF and RWEC. Impacts from the presence of structures are expected to vary in relation to the total number of foundations proposed (i.e., fewer structures would result in less extensive impacts). Therefore, Alternative G would be expected to produce roughly 35% less impact from this IPF by comparison. Reef effects would be reduced commensurate with the fewer number of foundations constructed under Alternative G.

At present, insufficient information is available to determine if differences in Project configuration between alternatives, specifically where foundations are located relative to sensitive benthic habitats, would contribute to a measurable difference in reef effects on sea turtles beyond those resulting from a simple reduction in the number of structures. However, the proposed configuration of Alternative G was specifically selected to avoid and minimize impacts to large-grained complex and complex habitats of particular value for certain fish species of concern, which could benefit bottom-feeding loggerhead sea turtles. As stated in Section 3.15.2.2.3, hydrodynamic effects are likely to lead to localized changes in the distribution of planktonic organisms (e.g., jellyfish) for certain sea turtle species, but shifts in prey distribution on the order of miles to tens of miles are unlikely to be biologically significant for species that migrate thousands of miles between seasonal habitats every year. Potential reef effects from increased biological productivity concentrating recreational fishing around foundations and concentrating prey availability would similarly be reduced. Therefore, while Alternative G would reduce the extent of measurable reef and hydrodynamic effects relative to the Proposed Action, those effects are likely to remain biologically insignificant. Potential long-term intermittent impacts would persist until decommissioning is complete and structures are removed. These impacts would also be **negligible** to **minor** adverse, offset by **minor** beneficial impacts to sea turtle species that benefit from reef effects.

Vessel traffic: Construction of Alternative G would result in a similar level of vessel traffic as the Proposed Action commensurate with the reduction in construction activities associated with 35 fewer foundations. An estimate of the reduced vessel trips per year associated with Alternative G construction is not available; however, it is expected to be slightly less than the Proposed Action. Therefore, the potential effects of construction vessel collisions on sea turtles from Alternative G would be **minor** adverse.

3.19.2.5.2 Cumulative Impacts

Offshore Activities and Facilities

Accidental releases and discharges: Alternative G would increase commercial vessel activity on the mid-Atlantic OCS, creating a potential source for accidental spills, trash, and debris. As with the Proposed Action, BOEM estimates that Alternative G would result in a negligible, up to 2%, increase in total chemical usage in the GAA relative to the No Action Alternative. When combined with other offshore wind projects, up to approximately 34 million gallons of coolants, oils, fuels, and lubricants could cumulatively be stored within WTG foundations and the OSS within the sea turtles GAA. Compliance with USCG regulations and BOEM requirements to minimize the risk of accidental spills and/or release of trash and debris would limit the volume and extent of Project-related trash/debris or invasive species potentially released accidentally. Additionally, as discussed in Section 3.19.1.1, the volumes of trash/debris potentially released accidentally under the No Action Alternative would be negligible and would not contribute to potential adverse impacts. Therefore, cumulative impacts associated with Alternative G when combined with past, present, and reasonably foreseeable future activities would be **negligible** to **minor** adverse because of the regulatory protections and limited likelihood of sea turtle exposure.

Climate change: The types of impacts from global climate change described for the No Action Alternative would occur under Alternative G, but Alternative G could also contribute to a long-term net decrease in GHG emissions. As described in Section 3.19.1.1, the interactions between climate change and other potential impacts associated with Alternative G are complex and difficult to predict with certainty. Northward shifts in sea turtle distributions due to warming waters could result in magnification of the anticipated impacts due to increased exposure. However, this magnification includes potential benefits associated with the creation of artificial reef habitat and could represent an increasing impact over the life of the Project. Based on the potential for increased exposure to the various effects of Alternative G described above, Alternative G when combined with other past, present, and reasonably foreseeable actions is expected to result in **minor** adverse cumulative impacts to sea turtles due to the anticipated shifts in distributions.

Noise: Alternative G would generate underwater noise effects during Project construction, throughout the operational life of the Project, and during Project decommissioning. Those impacts would be similar in magnitude and distribution but reduced in extent relative to the Proposed Action. These effects would combine with similar effects resulting from the construction, O&M, and decommissioning of other planned offshore wind projects on the mid-Atlantic OCS.

BOEM estimates a cumulative total of 3,155 offshore WTGs and OSS foundations could be developed by Alternative G in the GAA for sea turtles between 2022 and 2030. Sea turtles are anticipated to occur at generally low densities (see Section 3.19.1) near wind farms in the region, reducing the probability of individual exposure to noise effects. Noise sources associated with the Proposed Action could add to the ambient noise environment under the No Action Alternative if noise sources overlap temporally or geographically. Pile driving would represent the most significant source of noise. As noted in Section 3.19.2.2.2, there are three possible exposure scenarios for pile-driving noise: 1) concurrent exposure from two or more impact hammers for the same or adjacent projects; 2) non-concurrent exposure from multiple pile-driving events in the same years; and 3) exposure to concurrent and non-concurrent pile-driving events over multiple years. Although the extent, duration, and magnitude of exposure would vary based on Project-specific factors, the effects would be similar in nature to those described for the Proposed Action. Although exposure to pile-driving noise could disrupt behaviors of individual sea turtles, it is not expected to impair essential behavioral patterns. This is due to the temporary, localized nature of the effects and because normal behaviors are expected to resume once the sea turtle is no longer exposed to the noise. Permanent hearing impairment could occur to some individuals, but science has not determined whether changes in hearing ability would negatively impact the ability of sea turtles to feed, navigate, find suitable habitats, and reproduce. Due to the limited information about noise-related stress responses in sea turtles, physiological stress responses may likely occur concurrently with any other response, such as hearing impairment or behavioral disruptions.

For impulsive noise, BOEM anticipates that projects would employ soft starts during pile driving to allow the small number of turtles in the region to leave the area before underwater noise increases to injurious levels. Additionally, the implementation of sound attenuation systems, PSO exclusion and shutdown zones, and other planned EPMs (see Appendix F) would further reduce the likelihood of injury from the potential moderate cumulative impacts associated with pile driving. Vibratory pile driving associated with the sea-to-shore transition would create non-impulsive underwater noise, but similar to the effects of the impulsive impact hammer, only minor impacts to sea turtles are expected because of the combination of minimization measures used and the low densities of sea turtles in the RWF and RWEC. Potential behavioral effects are more likely to be related to vessel noise and disturbance than the vibratory pile driving itself.

With regard to other non-impulsive noise sources, potential behavioral impacts on sea turtles from vessel traffic noise would be intermittent and temporary as animals and vessels pass near each other. During construction and operation, helicopter traffic could cause some temporary behavioral reactions in sea turtles, but energy expenditures would be minimal.

Based on the above findings, noise-related impacts of Alternative G when combined with past, present, and reasonably foreseeable projects would result in **negligible** to **minor** adverse cumulative impacts to sea turtles depending upon the noise source.

<u>Presence of structures</u>: Alternative G would result in long-term negligible and minor beneficial impacts to sea turtles through the installation of 67 structures (65 WTGs and two OSSs) under Alternatives G1 to G3 relative to the No Action Alternative. The installation of monopile foundations would alter the character of the ocean environment, and their presence could affect sea turtle behavior. Increased prey availability, attraction to structures, and/or displacement could occur as a result of the installation of WTG facilities. As described in Section 3.19.2.2.2, structures associated with offshore wind farms are expected to provide

some level of reef effect and could benefit sea turtle foraging by creating new hard-bottom habitat, increasing pelagic productivity in local areas or promoting prey aggregations on foundations.

Some level of displacement of sea turtles out of the Lease Area and into areas with a higher potential for interactions with ships or recreational or commercial fishing gear could occur, particularly during construction phases, when elevated underwater noise levels occur. These intermittent impacts would persist until decommissioning is complete and structures are removed. Impacts could occur as a result of increased interaction with fishing gear, although annual monitoring, reporting, and cleanup of fishing gear around the base of the WTGs would reduce the extent of these impacts.

BOEM estimates a cumulative total of 3,155 offshore WTGs and OSS foundations for Alternative G plus all other future offshore wind projects in the sea turtles GAA. For similar reasons as described above, Alternative G when combined with past, present, and reasonably foreseeable projects would result in negligible to minor adverse cumulative impacts and potential minor beneficial cumulative impacts to sea turtles.

Vessel traffic: Alternative G would result in minor impacts to sea turtles through the addition of construction and maintenance vessels within the GAA for sea turtles. Those impacts would be similar, but reduced, in magnitude relative to the Proposed Action. This increased offshore wind–related vessel traffic during construction, and associated noise impacts, could result in localized, intermittent impacts on sea turtles, resulting in brief, minor behavioral responses that would be expected to dissipate once the vessel or the individual has left the area. However, BOEM expects that these brief responses of individuals to passing vessels would be unexpected given the patchy distribution of sea turtles; no stock- or population-level effects would be expected. Additionally, Alternative G would implement EPMs (see Table F-1 in Appendix F) to minimize vessel strikes.

BOEM estimates a peak of 262 vessels supporting offshore wind development will be operating in the sea turtles GAA over the next decade, of which up to 59 would be associated with Alternative G construction and six would be associated with O&M. This increase in vessel traffic poses an increased likelihood of collision-related injury and mortality relative to existing baseline conditions. Some sea turtlescould be injured or killed as a result, but the number of individuals impacted is not likely to significantly increase the existing mortality rate from vessel strikes. Additionally, BOEM expects that similar EPMs will be included in future offshore wind projects, helping to minimize the vessel strike risk. Therefore, cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **minor** adverse; however, BOEM does not expect the viability of sea turtle populations to be affected.

3.19.2.5.3 Conclusions

The construction and installation, O&M, and decommissioning of Alternative G would impact sea turtles through the same IPFs described for the Proposed Action. These impacts include exposure to increased vessel traffic, underwater noise impacts from Project construction and O&M, temporary habitat disturbance, and long-term habitat conversion. These adverse impacts would be avoided and minimized using the same EPMs as described in the Proposed Action (see Table F-1 in Appendix F). Alternative G would also generate similar beneficial reef effects but over a smaller area and with a reduced number of reef-forming structures. The resulting effects to sea turtles would therefore be similar to those described for the Proposed Action but reduced in extent and/or duration. However, the overall reduction in impacts would not be sufficient to alter the impact determinations for any sea turtle species. On this basis, BOEM concludes that Alternative G would result in **minor** adverse effects to sea turtles, with those effects partially offset by **minor** beneficial impacts for some sea turtle species.

3.19.2.6 Mitigation

Mitigation measures for sea turtles required through completed consultations, authorizations, and permits listed in Table 3.19-9 and in Appendix F, Table F-2, are incorporated into the Preferred Alternative (Alternative G). Additional mitigation measures identified by BOEM and cooperating agencies as a condition of state and federal permitting, or through agency-to-agency negotiations, are listed in Appendix F, Table F-3 and summarized here in Table 3.19-10. These measures, if adopted, would further define how the effectiveness and enforcement of EPMs would be ensured and improve accountability for compliance with EPMs by requiring the submittal of plans for approval by the enforcing agency(ies) and by defining reporting requirements. Because these measures ensure the effectiveness of and compliance with EPMs that are already analyzed as part of the Proposed Action, implementation of these measures would not further reduce the impact level of the Proposed Action from what is described in Section 3.19.2. BOEM and cooperating agencies have identified additional mitigation measures that could apply to the Project (Appendix F, Table F-3).

Table 3.19-9. Mitigation and Monitoring Measures Resulting from Consultations for Sea Turtles (Appendix F, Table F-2)

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
DRAFT NMFS BiOp Reasonable and Prudent Measures (RPMs) and Terms and Conditions (T&Cs)*	Draft NMFS Biological Opinion Proposed Reasonable and Prudent Measures were issued to BOEM for consideration on June 16, 2023. Final NMFS Biological Opinion Proposed Reasonable and Prudent Measures to be issued to BOEM for consideration on July 21, 2023. RPMs and Terms and Conditions to minimize the impact of incidental take of ESA-listed species were documented in the draft NMFS Biological Opinion dated June 16, 2023. These measures include adherence to mitigation measures specified in the final MMPA ITA to minimize impacts during pile driving and UXO detonation; compliance with requirements for vessel operations within the Delaware River and Delaware Bay included in the Incidental Take Statements provided with the Paulsboro Marine Terminal Biological Opinion (dated July 19, 2022); reporting requirements related to effects to, or interactions with, ESA-listed species; submittal of required plans (e.g., PSO Training Plan for Trawl Surveys, Passive Acoustic Monitoring Plan, Marine Mammal and Sea Turtle Monitoring Plan, Cofferdam Installation and Removal Monitoring Plan, Alternative Monitoring Plan/Night Time Pile Driving Monitoring Plan, Sound Field Verification Plan, North Atlantic Right Whale Vessel Strike Avoidance Plan) to NMFS GARFO with sufficient time for review, comment and approval; and conducting on-site observation and inspection to gather information on the effectiveness and implementation of measures to minimize and monitor incidental take.	These RPMs and Terms and Conditions would minimize the exposure of ESA-listed marine mammals to underwater noise impacts from impact and vibratory pile driving, UXO detonation, and HRG surveys. These RPMs and Terms and Conditions would also ensure that all incidental take that occurs is documented and reported to NMFS in a timely manner. Reporting requirements to document take would improve accountability for documenting take associated with the Proposed Action. In some cases, these RPMs and Terms and Conditions provide additional detail or clarification of measures that are included as part of the Proposed Action. Implementation of these RPMs and Terms and Conditions would provide incremental reductions in impacts on sea turtles but would not alter the overall impact determination of the Proposed Action.
Marine debris awareness training	The Lessee must ensure that vessel operators, employees, and contractors engaged in offshore activities pursuant to the approved COP 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 or by	These measures would complement existing EPMs and regulatory requirements, ensuring that impacts from the accidental releases and discharges IPF would remain negligible adverse.

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	contacting BSEE. The training videos, slides, and related material may be downloaded directly from the website. Operators engaged in marine survey activities must continue to develop and use a marine trash and debris awareness training and certification process that reasonably assures that their employees and contractors are in fact trained. The training process must include the following elements: • Viewing of either a video or slide show by the personnel specified above • An explanation from management personnel that emphasizes their commitment to the requirements • Attendance measures (initial and annual) • Recordkeeping and the availability of records for inspection by DOI By January 31 of each year, the Lessee must submit to the DOI an annual report 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 email to BOEM (at renewable_reporting@boem.gov) and to BSEE (at marinedebris@bsee.gov).	
Marine debris elimination	Materials, equipment, tools, containers, and other items used in Outer Continental Shelf (OCS) activities which could be lost or discarded overboard must be clearly marked with the vessel or facility identification. 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. Materials, equipment, tools, containers, and other items used in OCS activities which could be lost or discarded overboard must be properly secured to prevent loss overboard.	These measures would complement existing EPMs and regulatory requirements, ensuring that impacts from the accidental releases and discharges IPF would remain negligible adverse.
Pile driving monitoring plan	BOEM, BSEE, and USACE would ensure that Revolution Wind prepares and submits to BSEE (via TIMSWeb and notification email at protectedspecies@bsee.gov) and BOEM (at renewable_reporting@boem.gov) for review and concurrence preferably 180 days but no later than 120 days before start of pile	Revolution Wind has committed to implementing passive acoustic monitoring, pile driving monitoring, PSO coverage, sound field verification, and shutdown zones as part of the Proposed Action. Compliance with these EPMs would be enforced by

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	driving. Reporting to BSEE would follow JOINT NTL 2023-N01, Appendix B. The Lessee must not conduct pile driving operations at any time when lighting or weather conditions (e.g., darkness, rain, fog, sea state) prevent visual monitoring of the full extent of the clearance and shutdown zones including not initiating pile driving earlier than 1 hour after civil sunrise or later than 1.5 hours prior to civil sunset. Pile driving at night may only occur with prior approval of an Alternative Monitoring Plan (AMP). The Lessee must submit an AMP to BOEM and NMFS for review and approval at least 6 months prior to the planned start of pile-driving. This plan may include deploying additional observers, alternative monitoring technologies such as night vision, thermal, and infrared technologies, or use of PAM and must demonstrate the ability and effectiveness to maintain all clearance and shutdown zones during daytime as outlined below in Part 1 and nighttime as outlined in Part 2 to BOEM's and NMFS's satisfaction. The AMP must include two stand-alone components as described below: Part 1 – Daytime when lighting or weather (e.g., fog, rain, sea state) conditions prevent visual monitoring of the full extent of the clearance and shutdown zones. Daytime being defined as one hour after civil sunrise to 1.5 hours before civil sunset. Part 2 – Nighttime inclusive of weather conditions (e.g., fog, rain, sea state). Nighttime being defined as 1.5 hours before civil sunset to one hour after civil sunrise. If a protected marine mammal or sea turtle is observed entering or found within the shutdown zones after impact pile-driving has commenced, the Lessee would follow shutdown procedures outlined in the Protected Species Mitigation Monitoring Plan (PSMMP; Appendix B). The Lessee would notify BOEM and NMFS of any shutdown occurrence during piling driving operations within 24 hours of the occurrence unless otherwise authorized by BOEM and NMFS. The AMP should include, but is not limited to the following information: • Identification of night vision devices (e.g., mounted thermal/IR camera systems, hand-held or wearable NVDs, IR spotlights), if	BOEM, BSEE, and NMFS as indicated in Table F-2. Implementation and enforcement of these EPMs would minimize the potential for noise exposure sufficient to cause hearing injury and/or behavioral effects to sea turtles during of impact pile driving, vibratory pile driving, HRG surveys, and UXO detonation, as disclosed in the analysis of the Proposed Action. This agency-proposed mitigation measure specifies plan review and reporting requirements necessary to ensure pile driving monitoring plan effectiveness and enforcement. While adoption of these measures would increase accountability and ensure the effectiveness of EPMs, it would not alter the impact determination for any sea turtle species as analyzed herein.

Mitigation Measure	**Description**	**Expected Effect on Impacts from Action Alternatives**
	proposed for use to detect protected marine mammal and sea turtle species. • The AMP must demonstrate (through empirical evidence) 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. • Evidence and discussion of the efficacy (range and accuracy) of each device proposed for low visibility monitoring must include an assessment of the results of field studies (e.g., Thayer Mahan demonstration), as well as supporting documentation regarding the efficacy of all proposed alternative monitoring methods (e.g., best scientific data available). • Procedures and timeframes for notifying NMFS and BOEM of Revolution Wind's intent to pursue nighttime pile-driving. • Reporting procedures, contacts and timeframes. BOEM may request additional information, when appropriate, to assess the efficacy of the AMP. For mammals see Appendix B MMPA rule.	
PSO coverage	BOEM, BSEE, and the USACE must ensure that PSO coverage is sufficient to reliably detect sea turtles at the surface in exclusion 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 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 must be deployed. Determinations prior to construction must be based on review of the pile driving monitoring plan. Determinations during	Revolution Wind has committed to implementing passive acoustic monitoring, pile driving monitoring, PSO coverage, sound field verification, and shutdown zones as part of the Proposed Action. Compliance with these EPMs would be enforced by BOEM, BSEE, and NMFS as indicated in Table F-2. Implementation and enforcement of these EPMs would minimize the potential for noise exposure sufficient to cause hearing injury and/or behavioral effects to sea turtles during of impact pile driving,

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	construction must be based on review of the weekly pile driving reports and other information, as appropriate.	vibratory pile driving, HRG surveys, and UXO detonation, as disclosed in the analysis of the Proposed Action. This agency-proposed mitigation measure specifies plan review and reporting requirements necessary to ensure pile driving monitoring plan effectiveness and enforcement. While adoption of these measures would increase accountability and ensure the effectiveness of EPMs, it would not alter the impact determination for any sea turtle species as analyzed herein.
Sound field verification (SFV)	BOEM, BSEE, and NMFS may consider adjustments in the pre-start clearance and/or shutdown zones based on the initial SFV measurements. Revolution Wind will provide the initial results of each SFV measurement to BOEM, BSEE, and NMFS in an interim report after each monopile installation. Interim reports must be submitted as soon as they are available but no later than 48 hours after each installation. Revolution Wind will conduct an SFV to empirically determine the distances to the isopleths corresponding to sea turtle hearing injury and behavioral effect thresholds, including at the locations corresponding to the modeled distances to those thresholds. If initial SFV measurements indicate distances to the isopleths are less than the distances predicted by modeling assuming 10-decibel (dB) attenuation, Revolution Wind may request a modification of the clearance and shutdown zones for impact pile driving. For a modification request to be considered, Revolution Wind must have conducted SFV on at least three piles to verify that zone sizes are consistently smaller than predicted by modeling. If initial SFV measurements from any foundation indicate distances to the isopleths are greater than the distances predicted by modeling, Revolution Wind would implement additional sound attenuation measures prior to conducting additional pile driving. Additional measures may include improving the efficacy of the implemented noise attenuation technology and/or modifying the piling schedule to reduce the sound source. If modeled zones cannot be achieved by these corrective actions, Revolution Wind must install an	Revolution Wind has committed to implementing passive acoustic monitoring, pile driving monitoring, PSO coverage, sound field verification, and shutdown zones as part of the Proposed Action. Compliance with these EPMs would be enforced by BOEM, BSEE, and NMFS as indicated in Table F-2. Implementation and enforcement of these EPMs would minimize the potential for noise exposure sufficient to cause hearing injury and/or behavioral effects to sea turtles during of impact pile driving, vibratory pile driving, HRG surveys, and UXO detonation, as disclosed in the analysis of the Proposed Action. This agency-proposed mitigation measure specifies plan review and reporting requirements necessary to ensure pile driving monitoring plan effectiveness and enforcement. While adoption of these measures would increase accountability and ensure the effectiveness of EPMs, it would not alter the impact determination for any sea turtle species as analyzed herein.

Mitigation Measure	**Description**	**Expected Effect on Impacts from Action Alternatives**
	additional noise mitigation system to achieve the modelled ranges. Each sequential modification would be evaluated empirically by SFV of three additional foundations with the new sound attenuation technology. Additionally, in the event that SFV measurements continue to indicate distances to isopleths corresponding to hearing injury and behavioral effects thresholds are consistently greater than the distances predicted by modeling, BOEM, BSEE, or NMFS may expand the relevant clearance and shutdown zones and associated monitoring measures.	
Shutdown zone and pre-start clearance zone adjustment	BOEM, BSEE, and NMFS may consider adjustments in the pre-start clearance and/or shutdown zones based on the initial SFV measurements. Revolution Wind would provide the initial results of the SFV measurements to NMFS in an interim report after each monopile installation for the first three piles as soon as they are available but no later than 48 hours after each installation. Revolution Wind would conduct an SFV to empirically determine the distances to the isopleths corresponding to hearing injury and behavioral effects thresholds for sea turtles, including at the locations corresponding to the modeled distances to these thresholds. If initial SFV measurements indicate distances to the isopleths are less than the distances predicted by modeling assuming 10-decibel (dB) attenuation, Revolution Wind may request a modification of the clearance and shutdown zones for impact pile driving. For a modification request to be considered by NMFS, Revolution Wind must have conducted SFV on at least three piles to verify that zone sizes are consistently smaller than predicted by modeling. If initial SFV measurements indicate distances to the isopleths are greater than the distances predicted by modeling, Revolution Wind would implement additional sound attenuation measures prior to conducting additional pile driving. Additional measures may include improving the efficacy of the implemented noise attenuation technology and/or modifying the piling schedule to reduce the sound source. If modeled zones cannot be achieved by these corrective actions, Revolution Wind would install an additional noise mitigation system to achieve the modelled ranges. Each sequential modification would be evaluated empirically by SFV. Additionally, in the	This measure would not modify the impact determination for noise effects on sea turtles but would provide the information necessary to ensure that these effects do not exceed the levels analyzed herein.

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	event that SFV measurements continue to indicate distances to isopleths corresponding to hearing injury and behavioral effects thresholds are consistently greater than the distances predicted by modeling, NMFS may expand the relevant clearance and shutdown zones and associated monitoring measures.	
Monitoring zones for sea turtles	BOEM, BSEE, and the USACE would ensure that Revolution Wind would monitor a 500 m clearance and shutdown zone for sea turtles for the full duration of all pile-driving activities and for 30 minutes following the cessation of pile-driving activities and record all observations in order to ensure that all take that occurs is documented.	This measure would not modify the impact determination for noise effects on sea turtles but would provide the information necessary to ensure that these effects do not exceed the levels analyzed herein.
Vessel strike avoidance measures for sea turtles	Between June 1 and November 30, Revolution Wind 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 (500 m) at all times to maintain minimum separation distances from ESA-listed species. Alternative monitoring technology (e.g., night vision and thermal cameras) must 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 would 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 100 m or less of the operating vessel's forward path, the vessel operator must slow down to 4	Revolution Wind has committed to implementing a vessel strike avoidance policy, vessel separation distances, and vessel speed restrictions as part of the Proposed Action and as described in Table F-4. These measures include maintaining specified separation distances for NARW and unidentified large marine mammals, other large whales, and dolphins, porpoises, seals, and sea turtles. Revolution Wind's vessel strike avoidance policy directs that if an animal is sighted in the vessel's path, the vessel will divert or reduce speed and shift gears to neutral. Project design criteria to minimize vessel interactions with listed species would further clarify the distance at which vessels would divert their path and the distance at which vessels would reduce speed and shift to neutral. Adoption of these measures would further clarify requirements for vessel strike avoidance under the Proposed Action but would not alter the impact determinations for any sea turtle species as analyzed herein.

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	knots (unless unsafe to do so) and then proceed away from the turtle at a speed of 4 knots or less until there is a separation distance of at least 100 m at which time the vessel may resume normal operations. If a sea turtle is sighted within 50 m of the forward path of the operating vessel, the vessel operator must shift to neutral when safe to do so wait for the turtle to pass beyond 50m and then engage engines and travel proceed away from the turtle at a speed of 4 knots until a separation distance of 100 m is observed The vessel may resume normal operations once it has passed the turtle. d. Vessel captains/operators would 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 must slow to 4 knots while transiting through such areas. e. All vessel crew members must be briefed in the identification of ESA-listed species 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) must 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. g. If a vessel is carrying a PSO or trained lookout for the purposes of maintaining watch for North Atlantic right whales, an additional lookout is not required and this PSO or trained	

Mitigation Measure	**Description**	**Expected Effect on Impacts from Action Alternatives**
	lookout must maintain watch for whales, giant manta rays, and sea turtles.	
Sampling gear	All sampling gear would be hauled out at least once every 30 days, and all gear must be removed from the water and all gear must be removed from the water and stored on land between survey seasons to minimize risk of entanglement.	Revolution Wind has committed to EPMs to avoid and minimize potential entanglement risk to sea turtles from implementation of the Fisheries and Benthic Monitoring Plan. BOEM and BSEE would enforce compliance with these EPMs to ensure that impacts to sea turtles from monitoring activities remain negligible.
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 gear must be reported to NMFS (nmfs.gar.incidental-take@noaa.gov) and BSEE BSEE (via TIMSWeb and notification email at 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.	Revolution Wind has committed to EPMs to avoid and minimize potential entanglement risk to sea turtles from implementation of the Fisheries and Benthic Monitoring Plan. This measure would complement existing EPMs and ensure that entanglement risk associated with survey activities and potential impacts on sea turtles remain negligible.
Sea turtle disentanglement	Vessels deploying fixed gear (e.g., pots/traps) would have adequate disentanglement equipment (i.e., knife and boathook) onboard. Any disentanglement would 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) (NOAA 2008).	Revolution Wind has committed to EPMs to avoid and minimize potential entanglement risk to sea turtles from implementation of the Fisheries and Benthic Monitoring Plan. This measure would complement existing EPMs and ensure that entanglement risk associated with benthic monitoring gear and potential impacts on sea turtles remains negligible.
Sea turtle/Atlantic sturgeon identification and data collection	Any sea turtles or Atlantic sturgeon caught and/or retrieved in any fisheries' survey gear must 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 should be returned to the water as quickly as possible after completing the required handling and documentation.	Revolution Wind has committed to EPMs to avoid and minimize potential entanglement risk to sea turtles from implementation of the Fisheries and Benthic Monitoring Plan. This measure would not modify the impact determination for sea turtles but would provide the information necessary to ensure

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	a. The *Sturgeon and Sea Turtle Take Standard Operating Procedures* must be followed (NOAA 2021a; 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-kilohertz and 125-kilohertz encrypted tags (e.g., Biomark GPR Plus Handheld PIT Tag Reader), and this reader 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 must be done in accordance with the *Procedure for Obtaining Fin Clips from Sturgeon for Genetic Analysis* (NOAA 2019; https://media.fisheries.noaa.gov/dammigration/sturgeon_genetics_sampling_revised_june_2019.pdf). i. Fin clips must be sent to a 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 must be made for shipping and analysis in advance of submission of any samples; these arrangements must be confirmed in writing to NMFS within 60 days of the receipt of this incidental take statement (ITS). Results of genetic analysis, including assigned DPS of origin, must be submitted to NMFS within 6 months of the sample collection. ii. Subsamples of all fin clips and accompanying metadata forms must 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	that these effects do not exceed the levels analyzed herein.

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	for download at https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-take-reporting-programmatics-greater-atlantic. d. All captured sea turtles and Atlantic sturgeon must be documented with required measurements and photographs. The animal's condition and any marks or injuries mustbe described. This information must be entered as part of the record for each incidental take. A NMFS Take Report Form would be filled out for each individual sturgeon and sea turtle (download at: https://media.fisheries.noaa.gov/2021-11/Sturgeon-Sea-Turtle-Take-SOPs-external-11032021.pdf).	
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 mustbe 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 should be minimized (i.e., kept to 15 minutes or less) to limit the amount of stress placed on the animals. b. All survey vessels must 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 proposed actions. 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	This measure would not modify the impact determination for sea turtles but would provide the information necessary to ensure that these effects do not exceed the levels analyzed herein.

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	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), the USCG should 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 must 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 (NOAA 2020; 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 must be retained on board the survey vessel for transfer to an appropriately permitted partner or facility on shore as safe to do so. f. 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.	
Take notification	GARFO Protected Resources Division (PRD) and BSEE must be notified as soon as possible of all observed takes of sea turtles and Atlantic sturgeon occurring as a result of any fisheries survey. Specifically: a. GARFO PRD and DOI (BOEM and BSEE) must be notified within 24 hours of any interaction with a sea turtle or sturgeon (nmfs.gar.incidental- take@noaa.gov and DOI via TIMSWeb and notification email at protectedspecies@bsee.gov). The report must include at a minimum 1) survey name and applicable information (e.g., vessel name, station number); 2) GPS	This measure would not modify the impact determination for sea turtles but would provide a reporting and enforcement mechanisms to ensure that impacts to sea turtles do not exceed the levels analyzed herein.

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	coordinates describing the location of the interaction (in decimal degrees); 3) gear type involved (e.g., bottom trawl, 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 email must transmit a copy of the NMFS Take Report Form (download at: https://media.fisheries.noaa.gov/2021-07/Take%20Report%20Form%2007162021.pdf?null) 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 telephone, fax, or email, reports must be submitted as soon as possible; late reports must be submitted with an explanation for the delay. b. 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 must 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 must be comprehensive of all activities, regardless of whether ESA-listed species were observed.	
Monthly/ annual reporting requirements	BOEM and BSEE would ensure that Revolution Wind submits regular reports (in consultation with NMFS) necessary to document the amount or extent of take that occurs during all phases of the proposed action. Details of reporting must be coordinated between Revolution Wind, NMFS, BOEM, and BSEE. All reports would be sent to: nmfs.gar.incidental- take@noaa.gov and BSEE via TIMSWeb and notification email at protectedspecies@bsee.gov.	This measure would not modify the impact determination for sea turtles but would provide a reporting and enforcement mechanisms to ensure that impacts to sea turtles do not exceed the levels analyzed herein.
Data collection	BOEM and BSEE would ensure that all Project design criteria and BMPs incorporated in the Atlantic data collection consultation for offshore	This measure would not modify the impact determination for sea turtles but would provide the

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	wind activities (Baker and Howson 2021) shall be applied to activities associated with the construction, maintenance and operations of the Revolution Wind Project as applicable.	information necessary to ensure that these effects do not exceed the levels analyzed herein.
Periodic underwater surveys, reporting of monofilament and other fishing gear around WTG foundations	BOEM would require the Lessee to monitor potential loss of fishing gear WTG foundations by surveying at least ten percent of the total installed foundations annually. Survey design and effort may be modified based upon previous survey results after review and concurrence by BOEM. The Lessee must conduct surveys by remotely operated vehicles, divers, or other means to determine the locations and amounts of marine debris. The Lessee must submit annual reports to BOEM and BSEE by no later than April of the year following the survey. Survey reports would meet all requirements specified in Appendix F, Table F-2. Required data and reports may be archived, analyzed, published, and disseminated by BOEM.	This measure would not modify the impact determination for sea turtles, but it would provide the information necessary to ensure that effects do not exceed the levels analyzed herein.

* Information in these rows was taken directly from the final biological opinion (NMFS 2023) and has not been edited.

Table 3.19-10. Additional Mitigation and Monitoring Measures Under Consideration for Sea Turtles (Appendix F, Table F-3)

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
Federal survey mitigation	There are 14 NMFS scientific surveys that overlap with wind energy development in the northeast region and eight of these surveys overlap with the Project. As per NMFS and BOEM Survey Mitigation strategy actions 1.3.1, 1.3.2, 2.1.1, and 2.1.2 (Hare et al. 2022), within 120 calendar days of COP Approval, the Lessee must submit to BOEM a draft survey mitigation agreement between NMFS and the Lessee. The survey mitigation agreement will describe how the Lessee will mitigate the Project impacts on the eight NMFS surveys. If after consultation with NMFS NEFSC, BOEM deems the survey mitigation agreement acceptable, the mitigation will be considered required as a term and condition of the Project's COP approval. As soon as reasonably practicable, but no later than 30 days after the issuance of the Project's COP Approval, the Lessee will initiate	This measure provides a mechanism to avoid and minimize adverse impacts of project O&M on scientific surveys used to monitor the status of sea turtle populations and their forage and prey organisms. The implementation of this measure would ensure that federal surveys continue to provide the data and information necessary to monitor sea turtle population status. Federal survey data will be used to ensure that impacts to sea turtles remain within the levels considered in this FEIS, and to address uncertainties identified in impact analysis.

Mitigation Measure	Description	Expected Effect on Impacts from Action Alternatives
	coordination with NMFS NEFSC to develop the survey mitigation agreement described above. Mitigation activities specified under the agreement will be designed to mitigate the Project impacts on the following NMFS NEFSC surveys: (a) Spring Bottom Trawl survey; (b) Autumn Multi-species Bottom Trawl survey; (c) Ecosystem Monitoring survey; (d) NARW aerial survey; (e) Aerial marine mammal and sea turtle survey; (f) Shipboard marine mammal and sea turtle survey; (g) Atlantic surfclam and ocean quahog survey; and (h) Atlantic sea scallop survey. At a minimum, the survey mitigation agreement will describe actions needed and the means to address impacts on the affected surveys due to the preclusion of sampling platforms and impacts on statistical designs. In terms of statistical design, the project will be viewed as a discrete stratum in surveys that use a random stratified design. Other anticipated Project impacts on NMFS surveys such as changes in habitat and increased operational costs due to loss of sampling efficiencies may also be addressed in the agreement. The survey mitigation agreement will identify activities that will result in the generation of data equivalent to data generated by NMFS's affected surveys for the duration of the Project. The survey mitigation agreement will 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 listed above.	

3.19.2.6.1 Measures Incorporated into the Preferred Alternative

Mitigation measures required through completed consultations, authorizations, and permits listed in Table 3.19-9 and in Appendix F, Table F-2, are incorporated into Alternative G (Preferred Alternative). BOEM has identified additional measures in Table 3.19-10 as incorporated in the Preferred Alternative. These measures, if adopted, would further define how the effectiveness and enforcement of EPMs would be ensured and improve accountability for compliance with EPMs by requiring the submittal of plans for approval by the enforcing agency(ies) and by defining reporting requirements. Because these measures ensure the effectiveness of and compliance with EPMs that are already analyzed as part of the Proposed Action, implementation of these measures would not further reduce the impact level of the Proposed Action from what is described in Section 3.19.2.

3.20 Visual Resources (see section in main EIS)

3.21 Water Quality

3.21.1 Description of the Affected Environment and Environmental Consequences of the No Action Alternative for Water Quality

3.21.1.1 Offshore Water Quality

Geographic analysis area: The GAA for offshore water quality impacts comprises coastal and marine waters within 10 miles of Project components and within 15.5 miles of waterways for ports that could be used during the Project (Figure 3.21-1). This analysis area was chosen by analyzing a worst-case scenario of an incidental oil discharge under the Project, which would equate to the simultaneous release of all oils used by all Project components and vessels.

Affected environment: Offshore waters in the offshore water quality analysis area comprise coastal waters (e.g., ports and harbors, bays, and estuaries; marine waters) located within the state territory (within 3 nm of shore) and within federal waters. The coastal waters, including the Long Island Sound, Block Island Sound, Rhode Island Sound, Narragansett Bay, and Atlantic Ocean, are located offshore and include existing port facilities in New York, Connecticut, Rhode Island, Virginia, Massachusetts, Maryland, and New Jersey that could be used for the Project. Because of their highly seasonal variations in temperature, stratification, and productivity, marine waters are considered temperate. Water currents near the shoreline of the landing site flow predominantly southwest and northeast, and water currents in the northern and southeastern portions of the offshore portion of the Lease Area flow predominantly south and east (RPS 2022). Along the proposed RWEC, currents were measured up to approximately 0.2 m/s, which increased to approximately 0.4 m/s at Narragansett Bay (RPS 2022).

Near the Lease Area, NOAA reported annual increases in relative sea level trends at seven tide stations (NOAA 2021a, 2021b, 2021c, 2021d, 2021e, 2021f, 2021g), including four along the Long Island coast (Bridgeport, Port Jefferson, New London, and Montauk), two along the Rhode Island coast (Newport and Providence), and one along the Massachusetts coast (Woods Hole) with increases ranging from approximately 2.4 millimeters per year at Providence, Rhode Island, to 3.41 millimeters per year at Montauk, New York. These increasing sea levels in addition to storm surges that are increasing in both frequency and magnitude have contributed to coastal erosion that has led to eroded shorelines and increased susceptibility to flooding (New York Sea Grant 2018; Rhode Island Coastal Resources Management Council 2014).

Offshore water quality is characterized by dissolved oxygen (DO), chlorophyll *a*, nutrients (phosphorus and nitrogen), pathogens, contaminants (metals, polychlorinated biphenyls [PCBs], and organic and inorganic pollutants), turbidity, and point and nonpoint source pollution. These parameters, which are described in COP Section 4.2.2, influence coastal and marine environments and are indicators of ecosystem health. In general, salinity levels in the region have low variability. Salinity ranged from 23.7 to 28.4 practical salinity unit (psu) in Narragansett Bay from 2005 through 2015, as well as 32 to 33 psu in the broader New England lease area between 1980 and 2007 (BOEM 2021a).

As described in COP Section 4.2.4, surface water temperatures fluctuate up to 59 degrees Fahrenheit (°F) seasonally, with bottom waters experiencing smaller seasonal temperature fluctuations of approximately 41°F. Water temperatures are highest in July and August when the water column becomes stratified; RWF surface water temperatures are close to 68°F, while bottom waters are approximately 50°F. During the winter, average surface water temperatures range from approximately 39°F to 41°F, with bottom waters staying slightly warmer at the southern edge of Rhode Island Sound.

The Project, including offshore facilities and ports, would be located within the northeast and mid-Atlantic regions of the United States, as defined by the EPA (2012). Overall water quality along the Atlantic coast has been rated “fair” to “good” (EPA 2012). The Mid-Atlantic region’s water quality has been rated as generally “good,” and the northeast region’s water quality has been rated “fair” (EPA 2012). Water quality in the Long Island Sound from the Port Jefferson area eastward has generally improved or remained “very good” over the past decade (University of Maryland 2018). In general, water quality improves north to south from Narragansett Bay to the OCS (EPA 2012). Seventy percent of Rhode Island coastal waters are categorized as Type 1 (i.e., waters abut shorelines in natural undisturbed conditions) and Type 2 (i.e., waters are adjacent to predominantly residential areas; docks are allowed but other more intensive uses are not) (Rhode Island Division of Planning 2016). The water quality of estuarine waters off the coast of Rhode Island, including Narragansett Bay and nearby coastal ponds, has experienced degradation from nutrients and stormwater runoff carrying contaminants, although overall water quality in the area is generally good (Rhode Island Division of Planning 2016).

DO concentrations for offshore waters along the Atlantic coast and in the northeast region have been rated as generally “fair” (EPA 2012). DO concentrations have been rated as “good” within the Mid-Atlantic region (EPA 2012). Low DO concentrations have been measured at Long Island Sound monitoring stations (EPA 2012); however, water quality surveys at stations in the Rhode Island Sound revealed DO concentrations in surface and bottom waters above established levels for the “highest quality marine waters” (RI CRMC 2010). The upper reaches of Narragansett Bay and urbanized tidal rivers and embayments have been more heavily impacted by urbanized areas, which has led to continued water quality degradation, including low DO levels from excess nutrient (nitrogen) runoff (Rhode Island Division of Planning 2016). Chlorophyll *a* concentrations in samples from Rhode Island Sound and Block Island Sound were variable but representative of oceanic systems and comparable to each other and other coastal systems (RI CRMC 2010; RPS 2022). In Narragansett Bay, chlorophyll *a* concentrations were slightly higher compared to the overall northeast coast region (RI CRMC 2010; VHB 2023).

Pathogens and nutrients, which are transported from point and nonpoint sources of pollution to coastal waters through stormwater and wastewater discharges (RI CRMC 2016), are the most prevalent pollutants degrading water quality in Rhode Island (Rhode Island Division of Planning 2016). There have been no documented reports of harmful algal blooms or waterborne pathogen outbreaks in the Block Island Sound or Rhode Island Sound (EPA 2012; RI CRMC 2010); however, excess nutrients (nitrogen) in Narragansett Bay have led to oxygen depletion events (hypoxia and anoxia) that have degraded water quality conditions (EPA 2012; Rhode Island Division of Planning 2016). Dissolved nutrients from Narragansett Bay, in addition to those from Long Island Sound, reach OCS waters and contribute to degraded water quality conditions (VHB 2023). Nutrient levels in Rhode Island waters have decreased over the past 15 years (RI CRMC 2016; VHB 2023), and Rhode Island’s southern shoreline waters have overall remained acceptable for both swimming and shellfishing (Rhode Island Division of Planning 2016). Dissolved inorganic phosphorus (a form of phosphorus in fertilizers) concentrations at monitoring stations in the Long Island Sound and Narragansett Bay were rated as “poor” (0.05–0.20 milligram per liter) (EPA 2012).

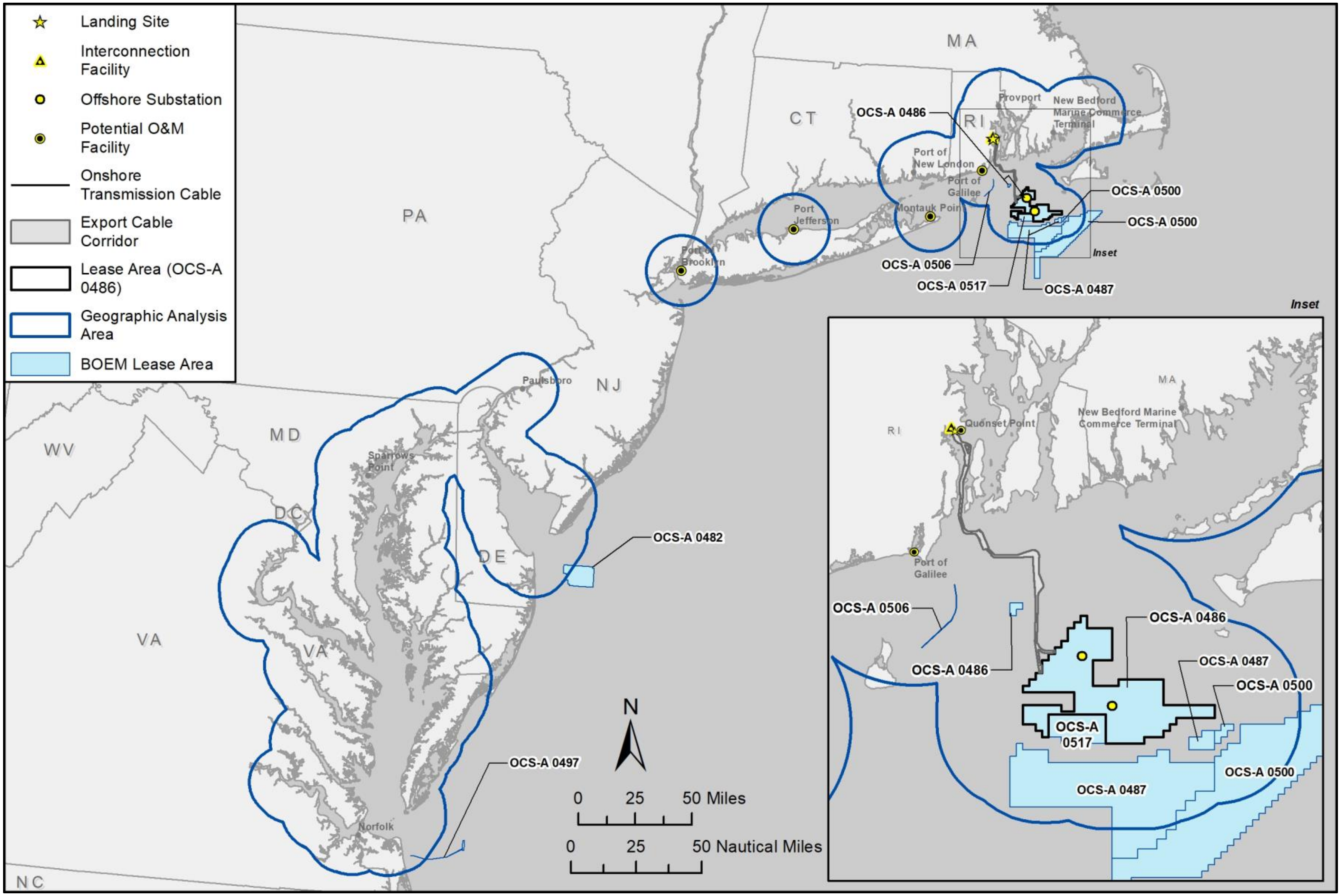

Figure 3.21-1. Geographic analysis area for offshore water quality.

Data are limited for water-column contaminant levels. In the Rhode Island Sound, organic contaminants were below detectable limits (USACE 2004; VHB 2023). Higher concentrations of heavy metals and PCBs have been identified in the northern reaches of Narragansett Bay compared to lower reaches (VHB 2023). Past investigations in and around the analysis area have not identified metal, PCB, or organic and inorganic pollutant concentrations above ambient water quality criteria (RI CRMC 2010). Contaminants could also reside within the sediment column and contribute to water quality conditions if disturbed. The Narragansett Bay is rated as “poor” for sediment toxicity (EPA 2012).

Turbidity is influenced by currents and storms, which lead to the resuspension of clay, silt, and fine-grained sand that comprise the sediment. Federal marine waters typically have very low concentrations of total suspended solids. Past investigations in the Rhode Island Sound revealed a range of turbidity levels from 0.1 to 7.4 milligram per liter of total suspended solids (USACE 2004; VHB 2023). Within the Narragansett Bay, annual average visibility depth in 2017–2019 ranged from 1.7 to 2.3 meters. See COP Section 4.2 for additional information regarding physical oceanographic and meteorological conditions within the analysis area.

3.21.1.2 Onshore Water Quality

Geographic analysis area: The GAA for onshore water quality impacts comprises the watersheds and groundwater basins that cross or fall within the Lease Area (Figure 3.21-2). This analysis area was chosen to capture the extent of the natural network of waterbodies that could be affected by construction and operations activities of the Project.

Affected environment: The onshore analysis area for surface water encompasses the Lower West Passage subwatershed (Hydrologic Unit Code 010900040908), where all Project components would be located (see Figure 3.21-2). The Lower West Passage subwatershed includes more than 500 surface water features (USGS 2004). The Project’s onshore facilities would not cross surface waterbodies. The nearest surface water features to the Lease Area that would contribute to flows to and from the Lease Area include 10 perennial streams/rivers, three artificial paths, 16 swamps/marshes, and 12 perennial lakes/ponds. These waterbodies, which are identified in Figure 3.21-2, would have the greatest influence on or from the Project and are therefore the focus of this analysis of onshore water quality impacts.

Surface water quality within the onshore water quality analysis area is generally good. None of the surface waterbodies near the Lease Area are currently listed as impaired (Rhode Island DEM 2021a). There is only one named waterbody—Mill Creek—near the Lease Area. Mill Creek, including its tributaries, is designated as Class B (Rhode Island DEM 2021b), which includes waters that are designated for fish and wildlife habitat and primary and secondary contact recreational activities (250 RICR 150.05 (Rhode Island Department of State 2018).

Groundwater resources are limited in the analysis area. The Project would be located (at its closest point) approximately 0.1 mile west of the Conanicut Island Aquifer, which is a sole source aquifer (URI Environmental Data Center and Rhode Island GIS 2016a). At its nearest points, the Project would be located approximately 1.2 miles east of the nearest groundwater recharge area and 2 miles east of the Pettaquamscutt groundwater reservoir, which is classified as a Class GAA groundwater (URI Environmental Data Center and Rhode Island GIS 2016b, 2016c). Class GAA groundwaters are known or presumed suitable for drinking water use without treatment and fall within a water supply priority for the area (Rhode Island DEM 2009).

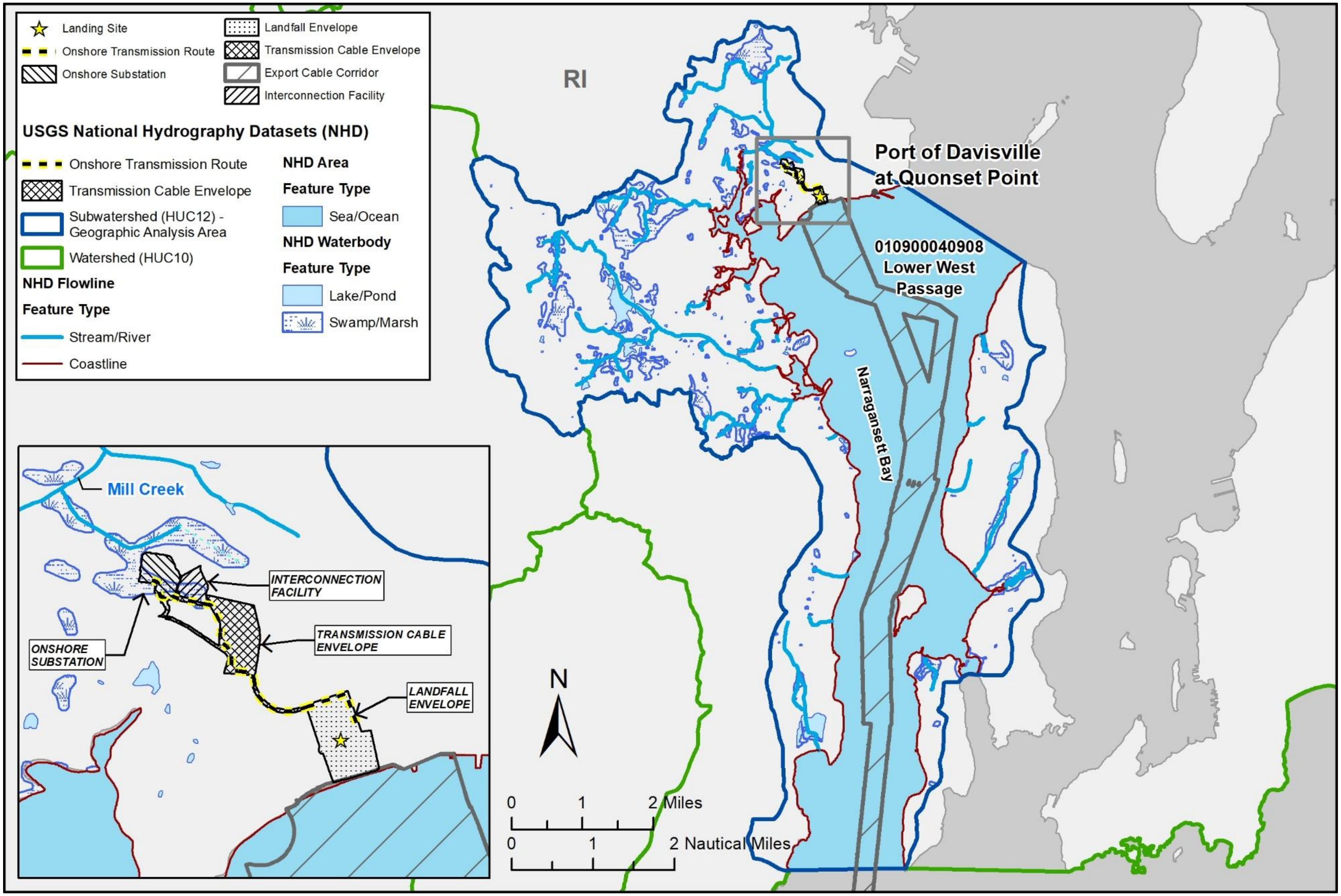

Figure 3.21-2. Geographic analysis area for onshore water quality.

There are 12 hazardous waste generating facilities near the Project (EPA 2021a). One of these facilities, the Senesco Marine Repair Yard, is approximately 0.7 mile from the eastern edge of the Project and 0.5 mile from the northeast corner of the cable corridor. The Senesco Marine Repair Yard has a current CWA violation within the past 12 months due to a violation of their NPDES permit (EPA 2021b). There is one hazardous waste cleanup site (EPA ID#: RID063900690) that includes the landfall work area (EPA 2021c). The waste storage container areas and tanks at this site have been "clean closed" in accordance with Resource Conservation and Recovery Act regulations, and there are no current identified violations at the facility (EPA 2021c, 2021d).

3.21.2 Environmental Consequences

3.21.2.1 Relevant Design Parameters, Impact-Producing Factors, and Potential Variances in Impacts

This assessment analyzes the maximum-case scenario; however, there is the potential for variances in the proposed Project build-out, as defined in the PDE (see Appendix D). The Project design parameters that would influence the magnitude of the impacts on offshore waters include the number of WTGs and distance of installed IAC. Construction and operations activities for fewer WTGs and a shorter IAC distance could result in similar or lower impacts than described in Section 3.21.2.2. For onshore waters, the Project design parameters that would influence the magnitude of the impacts include the location of and construction of or within the OnSS, ICF, and landfall work area. However, EPMs implemented during both construction and decommissioning, as well as a facility-specific spill plan implemented during O&M, would decrease the potential for impacts to onshore waters. Likewise, the implementation of the Project OSRP would help minimize impacts on offshore water quality from spills. These EPMs would be implemented across all alternatives; therefore, BOEM would not expect measurable potential variances in impacts across the alternatives.

See Appendix E1 for a summary of IPFs analyzed for water quality across all action alternatives. IPFs that are either not applicable to the resource or determined by BOEM to have a negligible adverse effect are excluded from Chapter 3 and provided in Table E1-4 in Appendix E1.

Table 3.21.1 discloses IPF findings carried forward for analysis in this section. Each alternative analysis discussion consists of the construction and installation phase, the O&M phase, the decommissioning phase, and the cumulative analysis. If these analyses are not substantially different, then they are presented as one discussion.

A detailed analysis of the Proposed Action follows the table. Detailed analysis of other considered action alternatives is also provided below the table if the analysis indicates that the alternative(s) would result in substantially different impacts than the Proposed Action. Offshore and onshore IPFs are addressed separately in the analysis if appropriate for the resource; not all IPFs have both an offshore and onshore component. Where feasible, calculations for specific alternative impacts are provided in Appendix E4 to facilitate reader comparison across alternatives.

The conclusion section within each alternative analysis discussion includes a rationale for the overall impact determination. The overall impact of any alternative would be **minor** adverse because the effects would be small, and the resource would be expected to recover completely without remedial or mitigating action.

Table 3.21-1. Alternative Comparison Summary for Water Quality

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
Accidental releases and discharges	**Offshore:** Routine spills would result in little change to water quality and would therefore be localized, short term, and **minor** adverse. In the unlikely event an allision or collision involving Project vessels or components resulted in a large spill, impacts on water quality would be **minor** to **moderate** adverse, and would range from short term to long term, depending on the type and volume of material released, the specific conditions (e.g., depth, currents, weather conditions) at the location of the spill, and effectiveness of the cleanup techniques deployed. Vessel operators would be required to comply with federal and international requirements for the management of shipboard trash and the USCG ballast water management requirements outlined in 33 CFR 151 and 46 CFR 162. Accidental releases of trash and debris would be infrequent and **negligible** adverse, and any allowed vessel discharges, such as bilge and ballast water, would be restricted to uncontaminated or appropriately treated liquids.	**Offshore**: Fuels and oils would be required for Proposed Action offshore equipment, vessels, and infrastructure. The volumes of fuels and oils and number of vessels required during O&M and decommissioning would be less than that required during construction and installation. Should a spill occur, response and containment procedures would limit the reach of the spill to a localized area, where changes to water quality would be detectable and would exceed water quality standards. As a result, adverse impacts on water quality would be short term, with spills generally dispersing within days (BOEM 2015), and **minor** to **moderate** adverse, depending on the severity of the spill. In the unlikely event an allision or collision involving Project vessels or components results in a large spill, impacts on water quality would also be **minor** to **moderate** adverse, and short term to long term, depending on the type and volume of material released and the specific conditions (e.g., depth, currents, weather conditions) at the location of the spill. Accidental releases of trash and debris would be infrequent and **negligible** adverse because Project actions would comply with federal and international requirements for management of shipboard trash and USCG regulations regarding waste and discharge. The Proposed Action could add accidental releases of fuels, oils, or hazardous material; sediment; and/or trash and debris to conditions under the No Action Alternative. BOEM estimates that the Project would result in an up-to-20% increase in total chemical usage over the No Action Alternative within the offshore water quality GAA. All vessels associated with the Proposed Action and other offshore wind projects would comply with the USCG requirements for the prevention and control of oil and fuel spills. Additionally, training and awareness of EPMs (see Table F-1 in Appendix F) proposed for waste management and mitigation of marine debris would be required of Revolution Wind Project personnel. For this reason, the Proposed Action	**Offshore:** Alternatives C through F would reduce the number of WTG foundations. This would require less fuels and oils associated with equipment, vessels, and infrastructure; less fuels and oils stored at WTGs; and less volumes of associated trash and debris. Differences in estimated total fuel and oil storage by alternative are disclosed in Appendix E4 and range from 444,000 gallons (Alternative F) to 563,000 gallons (Alternative D). These alternatives would also likely reduce the number and duration of vessels required during construction and installation, O&M, and decommissioning activities. Under all action alternatives, Project EPMs (see Table F-1 in Appendix F), permit requirements, controls, and procedures would be implemented as part of the Project to reduce the potential or extent of offshore spills, thereby avoiding or minimizing impacts on water quality. Therefore, impacts under these alternatives would be similar to the Proposed Action: short term to long term **negligible** to **moderate** adverse. Ongoing and planned actions, including those under Alternatives C through F, would require fuels and oils. Any Project-related accidental spills or discharges, including those associated with vessel allisions or collisions, would add to water quality impacts from other planned actions, albeit at potentially slightly lower volumes than the Proposed Action under these alternatives. Therefore, Alternatives C through F when combined with past, present, and reasonably foreseeable activities would result in short-term to long-term and **minor** to **moderate** adverse cumulative impacts on water quality.				**Offshore:** Alternative G would reduce the number of WTG foundations. This would require less fuels and oils associated with equipment, vessels, and infrastructure; less fuels and oils stored at WTGs; and less volumes of associated trash and debris as compared to the Proposed Action. Alternative G is estimated to result in a total fuel and oil storage of 473,000 gallons (see Appendix E4). This alternative would also likely reduce the number and duration of vessels required during construction and installation, O&M, and decommissioning activities. Project EPMs (see Table F-1 in Appendix F), permit requirements, controls, and procedures would be implemented as part of the Project to reduce the potential or extent of offshore spills, thereby avoiding or minimizing impacts on water quality. Therefore, impacts under this alternative would be similar to the Proposed Action: short term to long term **negligible** to **moderate** adverse. Ongoing and planned actions, including those under Alternative G, would require fuels and oils. Any Project-related accidental spills or discharges, including those associated with vessel allisions or collisions, would add to water quality impacts from other planned actions, albeit at potentially slightly lower volumes than the Proposed Action under these alternatives. Therefore, Alternative G when combined with past, present, and reasonably foreseeable activities would result in short-term to long-term and **minor** to **moderate** adverse cumulative impacts on water quality.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
		when combined with other past, present, and reasonably foreseeable projects would result in short-term to long-term **minor** to **moderate** adverse impacts.					
	Onshore: Surface and groundwater bodies would be monitored and managed to meet water quality standards and drinking water resource protections. As a result, adverse impacts from future onshore wind activities supporting OSW on onshore water quality under the No Action Alternative would be short term to long term **negligible** to **minor** adverse**.**	**Onshore:** Revolution Wind would comply with all permit and regulatory requirements related to water quality. As a result, the adverse impact on water quality would be short term **negligible** to **minor** adverse**.**	**Onshore:** Alternatives C through F would not change Project onshore activities; therefore, impacts would be the same as the Proposed Action: short term **negligible** to **minor** adverse.				**Onshore:** Alternative G would not change Project onshore activities; therefore, impacts would be the same as the Proposed Action: short term **negligible** to **minor** adverse.
Anchoring and new cable emplacement/ maintenance	**Offshore:** Disturbances to the seafloor during anchoring would temporarily increase suspended sediment and turbidity levels in and immediately adjacent to the anchorage area. BOEM anticipates that future offshore wind projects would use dredging only when necessary and would rely on other cable-laying methods for reduced impacts (such as jet plow or mechanical plow) where feasible. Furthermore, these impacts from individual projects would not overlap with one another spatially or temporally. As a result, adverse impacts on offshore water quality under the No Action Alternative would be **minor** adverse and temporary.	**Offshore**: Changes to water quality would be detectable but would not result in degradation of water quality that would exceed water quality standards. As a result, adverse impacts on offshore water quality from anchoring, potential in situ munitions and explosives of concern (MEC)/UXO disposal, and cable placement activities under the Proposed Action would be **minor** adverse and temporary. BOEM estimates a cumulative total of 10,158 acres of cabling-related disturbance for the Proposed Action plus all other future offshore wind projects and 5,066 acres of anchoring-related disturbance for the Proposed Action plus all other future offshore wind projects. Suspended sediment concentrations during activities other than dredging would be within the range of natural variability typical for the affected area. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in short-term **mino**r adverse cumulative impacts to water quality.	**Offshore:** Alternatives C through F would reduce the number of WTGs and scour protections associated with IACs. This would reduce seafloor disturbances during construction and installation, O&M and decommissioning. Differences in estimated acres of anchoring by alternative are disclosed in Appendix E4 and range from 1,812 acres (Alternative F) to 2,985 acres (Alternative D). Project design for IACs and the export cable has not occurred for Alternatives C through F; therefore, a comparison of cabling-related disturbance is not available. However, best professional judgment suggests that the footprint of the IAC, OSS-link cable, and RWEC would change and be slightly reduced to match the reduced number of WTGs. EPMs in Table F-1 in Appendix F would be implemented to avoid or minimize impacts to water quality, and Revolution Wind would comply with all permit and regulatory requirements related to water quality. As a result, impacts to water quality under these alternatives would be similar to the Proposed Action: **minor** adverse and temporary. Total anchoring and cabling seafloor disturbance that could occur from ongoing and planned actions, including those actions under Alternatives C through F, would be similar but slightly reduced from the Proposed Action (see Appendix E4 for a comparison of cumulative anchoring acreage estimates). Project-related seafloor disturbances would add to water quality impacts. Therefore, Alternatives C through F when combined with past, present, and reasonably foreseeable activities would result in short-term and **minor** adverse cumulative impacts on water quality.				**Offshore:** Alternative G would reduce the number of WTGs and scour protections associated with IACs. This would reduce seafloor disturbances during construction and installation, O&M, and decommissioning. Alternative G would result in 2,098 acres of anchoring and 3,400 acres of cabling disturbance (see Appendix E4). EPMs in Table F-1 in Appendix F would be implemented to avoid or minimize impacts on water quality, and Revolution Wind would comply with all permit and regulatory requirements related to water quality. As a result, impacts to water quality under this alternative would be similar to the Proposed Action: **minor** adverse and temporary. Total anchoring and cabling seafloor disturbance that could occur from ongoing and planned actions, including those actions under Alternative G, would be similar but slightly reduced from the Proposed Action (see Appendix E4 for a comparison of cumulative anchoring acreage estimates). Project-related seafloor disturbances would add to water quality impacts. Therefore, Alternative G when combined with past, present, and reasonably foreseeable activities would result in short-term and **minor** adverse cumulative impacts on water quality.
	Onshore: Degradations to onshore water quality from future onshore activities would be localized and temporary to long	**Onshore:** The implementation of EPMs in Table F-1 in Appendix F would avoid or minimize impacts on water quality, and Revolution Wind would	**Onshore:** Alternatives C through F would not change Project onshore activities; therefore, impacts would be the same as the Proposed Action: short term **negligible** to **minor** adverse.				**Onshore:** Alternative G would not change Project onshore activities; therefore, impacts

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
	term, depending on the nature of the activities, although overall water quality is expected to continue to meet Rhode Island water quality standards (250 RICR 150.05). As a result, adverse impacts from future activities on onshore water quality under the No Action Alternative would be temporary to long term **negligible** to **minor** adverse**.**	comply with all permit and regulatory requirements related to water quality. As a result, adverse impacts on onshore water quality under the Proposed Action would be short term **negligible** to **minor** adverse.					would be the same as the Proposed Action: short term **negligible** to **minor** adverse.
Port utilization	**Offshore:** Port activities could increase vessel traffic, suspension and turbidity from in-water work, and the risk of accidental spills or discharges. However, these actions would be localized, and port improvements would comply with all applicable permit requirements to minimize, reduce, or avoid impacts on water quality. As a result, adverse impacts on offshore water quality under the No Action Alternative would be short term to long term **minor** adverse.	**Offshore:** Port-related actions would be localized, and port activities would comply with all applicable permit requirements to minimize, reduce, or avoid impacts on water quality. As a result, adverse impacts on offshore water quality under the Proposed Action would be short to long term but **minor** adverse. Cumulative impacts associated with the Proposed Action and past, present, and reasonably foreseeable future activities would be **negligible** to **minor** adverse.	**Offshore:** The types and extent of port activities under Alternatives C through F would be the same as those described for the Proposed Action. Therefore, impacts would be short to long term but **minor** adverse. Cumulative impacts associated with Alternatives C through F and past, present, and reasonably foreseeable future activities would be the same as described for the Proposed Action: **negligible** to **minor** adverse.				**Offshore:** The types and extent of port activities under Alternative G would be the same as those described for the Proposed Action. Therefore, impacts would be short to long term but **minor** adverse. Cumulative impacts associated with Alternative G and past, present, and reasonably foreseeable future activities would be the same as described for the Proposed Action: **negligible** to **minor** adverse.
	Onshore: Future expansion or modification of existing ports in addition to increased use could increase land disturbance and the risk of accidental spills or discharges. However, these actions would be localized, and port improvements would comply with all applicable permit requirements to minimize, reduce, or avoid impacts on water quality. As a result, adverse impacts on onshore water quality under the No Action Alternative would be short to long term but **negligible** to **minor** adverse.	**Onshore:** The implementation of EPMs in Table F-1 in Appendix F would avoid or minimize impacts on water quality, and Revolution Wind would comply with all permit and regulatory requirements related to water quality. As a result, adverse impacts on onshore surface water quality under the Proposed Action would be temporary to short term **negligible** to **minor** adverse.	**Onshore:** Alternatives C through F would not change Project onshore activities; therefore, impacts would remain the same as the Proposed Action: temporary to short term **negligible** to **minor** adverse.				**Onshore:** Alternative G would not change Project onshore activities; therefore, impacts would remain the same as the Proposed Action: temporary to short term **negligible** to **minor** adverse.
Presence of structures	**Offshore:** Structures could disturb seafloor within the water quality GAA from foundation and scour protection installation and disrupt bottom current patterns, leading to increased movement, suspension, and deposition of sediments. BOEM anticipates that developers would implement best management practices to minimize seafloor disturbance from foundations, scour, and cable installation. As a result,	**Offshore:** BOEM estimates that the Project would result in an up-to-56% increase in total structures over the No Action Alternative within the offshore water quality GAA. EPMs in Table F-1 in Appendix F would be implemented to minimize seafloor disturbance from foundations and scour. As a result, adverse impacts on offshore water quality under the Proposed Action would be short term **minor** adverse. Because of the limited extent of impacts and BOEM's expectation that Revolution Wind and	**Offshore:** Alternatives C through F would reduce the number of WTGs and scour protection associated with foundations. This would require fewer acres of seafloor disturbance during construction and installation, O&M, and decommissioning that could disrupt bottom current patterns and lead to scouring; however, the types of seafloor disturbance and changes to patterns and flows would be similar. For comparison, Alternatives C and E would reduce seafloor disturbance associated with foundation construction by up to 35%, Alternative D would reduce seafloor disturbance by up to 21.5%, and Alternative F would reduce seafloor disturbance by up to 43%, as compared to the maximum-case scenario for the Proposed Action. Implementation of Alternative F in conjunction with Alternatives C, D, and E would further reduce seafloor disturbance for these alternatives by up to 8%, 21.5%, and 8%, respectively. As a result, impacts to offshore water quality under Alternatives C through F				**Offshore:** Alternative G would reduce the number of WTGs and scour protection associated with foundations. This would require fewer acres of seafloor disturbance during construction and installation, O&M, and decommissioning that could disrupt bottom current patterns and lead to scouring; however, the types of seafloor disturbance and changes to patterns and flows would be similar. For comparison, Alternative G would reduce seafloor disturbance associated with

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) Up to 100 WTGs	Alternative C (Habitat Alternative) 64 or 65 WTGs	Alternative D (Transit Alternative) 78 to 93 WTGs	Alternative E (Viewshed Alternative) 64 or 81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative) 65 WTGs
	impacts on offshore water quality under the No Action Alternative would be localized, short term, and **minor** adverse.	other developers would comply with all applicable permit requirements to minimize, reduce, or avoid impacts on water quality, the Proposed Action when combined with past, present, and reasonably foreseeable projects would also result in **minor** adverse and long-term impacts to water quality.	would be similar to the Proposed Action: short term **minor** adverse. See Table E-4 in Appendix E for foundation construction footprint calculations per alternative. Alternatives C through F would result in an up-to-31% to 52% increase in structures from the No Action Alternative. New structures related to Alternatives C through F would add to seafloor disturbances and disruptions to bottom current patterns that would lead to scouring and associated water quality impacts. However, for similar reasons as the Proposed Action, Alternatives C through F when combined with past, present, and reasonably foreseeable activities would result in long-term and **minor** adverse cumulative impacts on water quality.				foundation construction by up to 35%, as compared to the maximum-case scenario for the Proposed Action. As a result, impacts to offshore water quality under Alternative G would be similar to the Proposed Action: short term **minor** adverse. See Table E-4 in Appendix E for foundation construction footprint calculations. Alternative G would result in a 37% increase in structures from the No Action Alternative. New structures related to Alternative G would add to seafloor disturbances and disruptions to bottom current patterns that would lead to scouring and associated water quality impacts. However, for similar reasons as the Proposed Action, Alternative G when combined with past, present, and reasonably foreseeable activities would result in long-term and **minor** adverse cumulative impacts on water quality.
	Onshore: The presences of structures from future onshore activities supporting OSW would result in an increase in impervious surfaces that could contribute to stormwater runoff to nearby waterbodies. These activities would be expected to comply with any applicable permit requirements to implement erosion and stormwater controls to minimize, reduce, or avoid impacts on water quality. As a result, adverse impacts on onshore water quality under the No Action Alternative would be short to long term **negligible** to **minor** adverse**.**	**Onshore:** The implementation of EPMs in Table F-1 in Appendix F would avoid or minimize impacts on water quality, and Revolution Wind would comply with all permit and regulatory requirements related to water quality. As a result, impacts on onshore water quality under the Proposed Action would be localized, short term, and **negligible** to **minor** adverse.	**Onshore:** Alternatives C through F would not change Project onshore activities; therefore, impacts would be the same as the Proposed Action: short term **negligible** to **minor** adverse.				**Onshore:** Alternative G would not change Project onshore activities; therefore, impacts would be the same as the Proposed Action: short term **negligible** to **minor** adverse.

3.21.2.2 Alternative A: Impacts of the No Action Alternative on Water Quality

3.21.2.2.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for water quality (see Section 3.21.1) would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities and by permitted and constructed offshore wind COP projects within the GAA. These IPFs are described and analyzed in Appendix E1.

3.21.2.2.2 Cumulative Impacts

Offshore Water Quality

This section discloses potential offshore water quality impacts associated with future offshore wind development (without the Proposed Action). The cumulative impact analysis for the No Action Alternative for planned non-offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E1.

<u>Accidental releases and discharges:</u> Future offshore wind activities could contribute to changes in offshore water quality from a spill or release during routine vessel or equipment use, a spill at an offshore wind facility, a spill during construction and installation due to a vessel allision or collision, or the accidental discharge of trash and debris.

Numerous offshore wind projects could occur with overlapping construction schedules between 2022 and 2032 (see Appendix E). This EIS estimates that up to approximately 2.9 million gallons of coolants, fuels, oils, and lubricants could be stored within WTG foundations and the OSS within the offshore water quality GAA. Other chemicals, including grease, paints, and sulfur hexafluoride, would also be used at the offshore wind projects. BOEM anticipates that the likelihood of a major spill of these chemicals during construction due to vessel allisions, collisions, O&M activities, or weather events is very low (once per 1,000 years) (Bejarano et al. 2013). All future offshore wind projects would be required to comply with regulatory requirements related to the prevention and control of accidental spills administered by the USCG and BSEE. OSRPs are required for each project and would provide for rapid spill response, cleanup, and other measures that would help to minimize potential impacts on affected resources from spills. WTGs and OSSs are generally self-contained and would not generate discharge (see COP Appendix D). Vessels would also have onboard containment measures that would further reduce the impact of a spill in the event of an allision or collision.

A release during construction or operations of offshore wind projects would generally be classified as "routine" and minor adverse because of the size of the release (i.e., spills less than 10 barrels, or 420 gallons) and its rapid dispersion (BOEM 2015). Routine spills would result in little change to water quality and would therefore be localized, short term, and **minor** adverse. In the unlikely event an allision or collision involving Project vessels or components resulted in a large spill, impacts on water quality would be **minor** to **moderate** adverse, and would range from short term to long term, depending on the type and volume of material released, the specific conditions (e.g., depth, currents, weather conditions) at the location of the spill, and effectiveness of the cleanup techniques deployed.

Vessel operators would be required to comply with federal and international requirements for the management of shipboard trash and the USCG ballast water management requirements outlined in 33

CFR 151 and 46 CFR 162. Accidental releases of trash and debris would be infrequent and **negligible** adverse, and any allowed vessel discharges, such as bilge and ballast water, would be restricted to uncontaminated or appropriately treated liquids.

<u>Anchoring and new cable emplacement/maintenance</u>: Offshore wind activities would contribute to changes in offshore water quality from resuspension and deposition of sediments during anchoring. BOEM estimates that approximately 1,862 acres of seafloor could be impacted by anchoring under the No Action Alternative within the offshore water quality GAA. Disturbances to the seafloor during anchoring would temporarily increase suspended sediment and turbidity levels in and immediately adjacent to the anchorage area. Currents and storms currently contribute to turbidity throughout the water column from the resuspension of clay, silt, and fine-grained sand making up the sediment. As a result, adverse impacts on offshore water quality under the No Action Alternative would be **minor** adverse and temporary.

BOEM estimates that approximately 6,149 acres of seafloor could be impacted by cable placement under the No Action Alternative within the offshore water quality GAA due to reasonably foreseeable offshore wind development. Similar to anchoring, these activities would contribute to changes in offshore water quality from the resuspension and deposition of sediment. Sediment suspension and deposition from offshore wind projects would be limited in terms of extent and duration.

BOEM anticipates that future offshore wind projects would use dredging only when necessary and would rely on other cable laying methods for reduced impacts (such as jet plow or mechanical plow) where feasible. Furthermore, these impacts from individual projects would not be expected to overlap with one another spatially or temporally. For these reasons, sediment suspension associated with other wind projects would be localized, **minor** adverse, and temporary.

<u>Port utilization:</u> Offshore wind development would use nearby ports as described in Chapter 2 and could also require port expansion or modification, resulting in increased vessel traffic or increased suspension and turbidity from in-water work. These activities could also increase the risk of accidental spills or discharges. However, these actions would be localized, and port improvements would comply with all applicable permit requirements to minimize, reduce, or avoid impacts on water quality. As a result, adverse impacts on offshore water quality under the No Action Alternative would be short term to long term **minor** adverse.

<u>Presence of structures:</u> Reasonably foreseeable offshore wind projects are estimated to result in no more than 181 structures by 2030 within the offshore water quality GAA. These structures could disturb up to 228 acres of seafloor within the water quality GAA from foundation and scour protection installation and disrupt bottom current patterns, leading to increased movement, suspension, and deposition of sediments. Scouring, which could lead to impacts on water quality through the formation of sediment plumes (Harris et al. 2011), would generally occur in shallow areas with tidally dominated currents. Structures could reduce wind-forced mixing of surface waters, whereas water flowing around the foundations could increase vertical mixing (Carpenter et al. 2016; Cazenave et al. 2016). Results from a recent BOEM (2021b) hydrodynamic model of four different WTG build-out scenarios of the offshore RI/MA WEA found that offshore wind projects could alter local and regional physical oceanic processes (e.g., currents, temperature stratification) through their influence on currents from WTG foundations and by extracting energy from the wind. The results of the hydrodynamic model study show that the introduction of offshore wind structures into the offshore area modifies the oceanic responses of current magnitude, temperature, and wave heights

by 1) reducing the current magnitude through added flow resistance, 2) influencing the temperature stratification by introducing additional mixing, and 3) reducing current magnitude and wave height by extracting of energy from the wind by the OSW turbines. Alterations in currents and mixing would affect water quality, including DO, but would vary seasonally and regionally. WTGs and OSSs associated with reasonably foreseeable offshore wind projects would be placed in average water depths of 100 to 200 feet where current speeds are relatively low, and offshore cables would be buried where possible. Cable armoring would be used where burial is not possible, such as in hard-bottomed areas. BOEM anticipates that developers would implement best management practices to minimize seafloor disturbance from foundations, scour, and cable installation. As a result, impacts on offshore water quality under the No Action Alternative would be localized, short term, and **minor** adverse.

The exposure of offshore wind structures, which are mainly made of steel, to the marine environment can result in corrosion to the structures without protective measures. Corrosion is a general problem for offshore infrastructures, and corrosion protection systems are necessary to maintain the structural integrity. Protective measures for corrosion (e.g., coatings, cathodic protection systems) are often in direct contact with seawater and have different potentials for emissions, e.g., galvanic anodes emitting metals, such as aluminum, zinc, and indium, and organic coatings releasing organic compounds due to weathering and/or leaching. The current understanding of chemical emissions for offshore wind structures is that emissions appear to be low, suggesting a low environmental impact, especially if compared to other offshore activities, but these emissions may become more relevant for the marine environment with increased numbers of offshore wind projects and a better understanding of the potential long-term effects of corrosion protection systems (Kirchgeorg et al. 2018).

Conclusions

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and decommissioning would not occur; and potential impacts to offshore water quality associated with the Project would not occur. However, ongoing and future activities would have continuing temporary to long-term impacts on water quality from offshore spills or discharge, resuspension and deposition of sediments, scouring, or changes to current patterns and mixing.

BOEM anticipates that the range of impacts for reasonably foreseeable offshore wind activities would be minor to moderate adverse due to short-term erosion and sedimentation, discharges, and dispersal of contaminants during routine spills. As described in Appendix E1, BOEM anticipates that the range of impacts for ongoing activities and reasonably foreseeable offshore activities other than offshore wind would be minor to moderate adverse due to temporary or short-term disturbance to sediments during construction activities.

BOEM anticipates that the impacts associated with future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would result in **minor** adverse impacts because the effects would be small and the resource would recover completely.

Onshore Water Quality

This section discloses potential onshore water quality impacts associated with future offshore wind development (without the Proposed Action). The cumulative impact analysis for the No Action

Alternative for planned non-offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E1.

<u>Accidental releases and discharges:</u> Reasonably foreseeable onshore activities supporting OSW could contribute to changes in water quality from accidental releases and discharges, dispersal of contaminants during routine spills, or accidental releases of contaminated or hazardous materials or debris if surface water bodies are intersected. Routine spills that reach surface water would be expected to disperse rapidly (BOEM 2015).

Future onshore activities supporting OSW would be expected to comply with any applicable permit requirements, including spill controls, to minimize, reduce, or avoid impacts on surface water and groundwater quality. Degradations to onshore water quality from future onshore activities are expected to be localized and temporary to long term, depending on the nature of the activities, although overall water quality is expected to continue to meet Rhode Island water quality standards (250 RICR 150.05) (Rhode Island Department of State 2018). Surface and groundwater bodies would be monitored and managed to meet water quality standards and drinking water resource protections. As a result, adverse impacts from future onshore activities supporting OSW on onshore water quality under the No Action Alternative would be short term to long term **negligible** to **minor** adverse.

<u>New cable emplacement/maintenance:</u> Future onshore activities supporting OSW could result in changes to water quality from cable-related land disturbance, such as surficial digging, land clearing, trenching, HDD, and use of vehicles, that could contribute to erosion and sedimentation. These activities would be expected to comply with any applicable permit requirements to implement erosion and stormwater controls to minimize, reduce, or avoid impacts on water quality. Degradations to onshore water quality from future onshore activities are expected to be localized and temporary to long term, depending on the nature of the activities, although overall water quality is expected to continue to meet Rhode Island water quality standards (250 RICR 150.05). Waterbodies would be monitored and managed to meet water quality standards and drinking water resource protections. As a result, adverse impacts from future activities on onshore water quality under the No Action Alternative would be temporary to long term **negligible** to **minor** adverse.

<u>Port utilization:</u> Future onshore activities supporting OSW are expected to continue to use ports and would likely require expansion or modification of existing onshore port facilities in the analysis area. These port-related activities would include land disturbance.

Future expansion or modification of existing ports in addition to increased use could also increase the risk of accidental spills or discharges. However, these actions would be localized, and port improvements would comply with all applicable permit requirements to minimize, reduce, or avoid impacts on water quality. As a result, adverse impacts on onshore water quality under the No Action Alternative would be short to long term but **negligible** to **minor** adverse. Port activities would not include surficial digging that could encounter groundwater; as a result, there are no potential impacts on groundwater from port use (Rhode Island Department of State 2018).

<u>Presence of structures:</u> The presences of structures from future onshore activities supporting OSW would result in an increase in impervious surfaces that could contribute to stormwater runoff to nearby waterbodies. These activities would be expected to comply with any applicable permit requirements to implement erosion and stormwater controls to minimize, reduce, or avoid impacts on water quality. As a

result, adverse impacts on onshore water quality under the No Action Alternative would be short term to long term **negligible** to **minor** adverse.

Conclusions

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and decommissioning would not occur; and potential impacts on onshore water quality associated with the Project would not occur. However, ongoing and future activities would continue to contribute temporary to long-term impacts on water quality from onshore erosion and sedimentation, or discharges, dispersal of contaminants during routine spills.

BOEM anticipates that the range of impacts for reasonably foreseeable offshore wind activities and connected onshore activities would be **negligible** to **minor** adverse due to short-term erosion and sedimentation, discharges, and dispersal of contaminants during accidental and routine spills. As described in Appendix E1, BOEM anticipates that the range of impacts for ongoing and reasonably foreseeable offshore activities other than offshore wind would be **negligible** to **minor** adverse primarily due to temporary or short-term disturbance to sediments during port expansion and other onshore construction and installation activities (e.g., beach and coastal restoration projects). Other reasonably foreseeable non–offshore wind IPFs with potential for routine and/or accidental releases or sediment disturbance are either 1) not expected to overlap with the GAA spatially and temporally or 2) would not be expected to have measurable impacts on the overall water quality in the GAA as discussed in Appendix E1.

BOEM anticipates that the impacts associated with future offshore wind activities in the GAA for onshore water quality combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would result in **minor** adverse impacts because the effects would be small and the resource would recover completely without remedial or mitigating action.

3.21.2.3 Alternative B: Impacts of the Proposed Action on Water Quality

3.21.2.3.1 Construction and Installation

Offshore Activities and Facilities

<u>Accidental releases and discharges:</u> Fuels and oils would be required for Proposed Action offshore construction and installation equipment, vessels, and infrastructure over the approximately 15-month construction and installation period. In the event of a spill or release during construction and installation activities, offshore water quality would be degraded. Most inadvertent spills of fuels and oils used during construction and installation would be classified as routine and minor adverse because of their size (i.e., spills less than 10 barrels, or 420 gallons) and rapid dispersion (BOEM 2015). As described in Section 3.21.1.2, the likelihood of a spill due to construction and installation activities and weather events is low (once per 1,000 years). A draft OSRP has been prepared for the Project and includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills (see COP Appendix D).

Fuels and oils would be used and stored at WTGs and OSSs. A maximum of approximately 3,204 gallons of coolants, fuels, oils and lubricants would be stored at each WTG (or a total of approximately 320,400 gallons for the maximum 100 proposed WTGs), and a maximum of 132,400 gallons of fuels, oils, and lubricants would be stored at each OSS (or a total of approximately 264,800 gallons for the two proposed OSSs). Secondary containment measures would be implemented for all diesel tanks at WTGs (VHB 2023). Under the Proposed Action, the highest possible spill would be the inadvertent release of fuels and oils stored at WTGs and OSSs, which would contain up to 585,200 gallons of fuels and oils. Project EPMs (see Table F-1 in Appendix F), permit requirements, controls, and procedures would be implemented as part of the Project to reduce the potential or extent of offshore spills, thereby avoiding or minimizing impacts on water quality. Should a spill occur, response and containment procedures would limit the reach of the spill to a localized area, where changes to water quality would be detectable and would exceed water quality standards. As a result, adverse impacts on water quality would be short term, with spills generally dispersing within days (BOEM 2015), and **minor** to **moderate** adverse, depending on the severity of the spill.

Construction of the Proposed Action would require as many as 59 vessels. Vessels would be equipped with spill containment and cleanup materials, and any accidental spill or release of fuels, oils, or other hazardous materials would be managed through the Project's OSRP (VHB 2023). All construction-related vessels would be required to comply with regulatory requirements related to the prevention and control of spills and discharges (VHB 2023). The chance of a spill occurring due to vessel allisions or collisions would be low (once per 1,000 years). In the unlikely event an allision or collision involving Project vessels or components results in a large spill, impacts on water quality would be **minor** to **moderate** adverse, and short term to long term, depending on the type and volume of material released and the specific conditions (e.g., depth, currents, weather conditions) at the location of the spill.

The Proposed Action could also result in accidental releases of trash and debris from vessels or in situ MEC/UXO disposal into offshore waters. EPMs in Table F-1 in Appendix F would be implemented to avoid or minimize impacts on water quality from releases of trash or debris. Accidental releases of trash and debris would be infrequent and **negligible** adverse because vessels would comply with federal and international requirements for management of shipboard trash and USCG regulations regarding waste and discharge. Foreign-flagged vessels would also have a USCG-compliant and certified ballast water management system. Any allowed vessel discharges, such as bilge and ballast water, would be restricted to uncontaminated or appropriately treated liquids. Should an accidental release occur, it would be limited to the localized area; adverse impacts on water quality would be short term **minor** to **moderate** adverse.

Existing restoration and protection initiatives established for offshore areas, including those developed as part of the Long Island Sound Study initiative (Long Island Sound Study 2021), Bay Assessment & Response Team (Rhode Island DEM 2021c), Rhode Island Beach Monitoring Program (Rhode Island Department of Health 2021), and Rhode Island Environmental Monitoring Collaborative (RIEMC 2021), would help identify and manage water quality degradations, should they occur.

<u>Anchoring and new cable emplacement/maintenance:</u> Approximately 3,178 acres and 4,009 acres of seafloor could be impacted by anchoring and cable placement, respectively, under the Proposed Action within the offshore water quality GAA. Potential in situ MEC/UXO disposal could also result in sediment suspension and disturbance. Disturbances to the seafloor would temporarily increase suspended sediment and turbidity levels in and immediately adjacent to the anchorage, disposal, or cable placement area. Sediment modeling completed for the Proposed Action indicates that sediment suspension and deposition would occur during in-water offshore activities (RPS 2022). The modeling showed that in most locations

the total suspended solids plumes are limited to the bottom 10 feet of the water column and are temporary at any given location. Suspended sediments would settle within hours or days, including up to 6.7 hours in the RWF IAC, 61 hours in the RWEC-OCS, approximately 70 hours along the RWEC-RI, and 70 hours at the landing site where HDD would occur.

EPMs in Table F-1 in Appendix F would avoid or minimize impacts on water quality, and Revolution Wind would comply with all permit and regulatory requirements related to water quality. Changes to water quality would be detectable but would not result in degradation of water quality that would exceed water quality standards. As a result, adverse impacts on offshore water quality from anchoring and cable placement activities under the Proposed Action would be **minor** adverse and temporary.

Port utilization: The Project would use nearby ports for a construction hub, for WTG storage and pre-commissioning, and for foundation marshalling and fabrication. These activities would result in increased vessel traffic and increased in-water activities, which would contribute to increased suspension and turbidity. As many as 59 vessels would be required during construction and installation. These activities could also increase the risk of accidental spills or discharges. Port-related actions would be localized, and port activities would comply with all applicable permit requirements to minimize, reduce, or avoid impacts on water quality. In addition, EPMs in Table F-1 in Appendix F would avoid or minimize impacts on water quality. As a result, adverse impacts on offshore water quality under the Proposed Action would be short to long term but **minor** adverse.

It is not known at this time if port expansions or modifications would be required for the Proposed Action (VHB 2023). If so, these activities would require in-water work, including vessel use, that would increase sediment suspension and turbidity. Impacts from these activities would be similar to those described above for port uses.

Presence of structures: The Proposed Action would result in up to 100 monopile foundations for WTGs and two monopile foundations for OSSs within the GAA for offshore water quality. These structures could temporarily disturb up to approximately 3,172 acres (31.1 acre per foundation) during seafloor preparation. Foundations would encompass a total footprint of approximately 71 acres (0.7 acre per foundation) of seafloor disturbance and scour protection. Seafloor disturbance would occur from foundation and scour protection installation, and the presence of structures would disrupt bottom current patterns and lead to increased movement, suspension, and deposition of sediments. Project-related scouring could impact water quality through the formation of sediment plumes, and structures could reduce wind-forced mixing of surface waters. Flows around foundations could increase vertical mixing of the water column. These changes in currents and mixing would affect water quality but would vary seasonally and regionally. EPMs in Table F-1 in Appendix F would be implemented to minimize seafloor disturbance from foundations and scour, including the installation of scour protection and cable armoring where burial is not possible, that would avoid or minimize impacts on water quality, and Revolution Wind would comply with all permit and regulatory requirements related to water quality. As a result, adverse impacts on offshore water quality under the Proposed Action would be localized, short term, and **minor** adverse.

Onshore Activities and Facilities

Accidental releases and discharges: Onshore facilities would not cross surface waterbodies. Onshore construction equipment, vehicles, and infrastructure under the Proposed Action would require fuels and oils during the construction and installation period. Although unlikely due to distance to closest stream of 200 feet, any inadvertent spills occurring during construction and installation, such as the release of fuels and oils from vehicles or infrastructure, would be classified as routine and minor adverse (BOEM 2015).

Table F-1 in Appendix F includes EPMs to avoid or minimize potential spill impacts on water quality, to comply with all general construction permit requirements, and to implement runoff controls and buffers. In addition, Revolution Wind would develop and implement a stormwater pollution prevention plan and HDD inadvertent release plan to protect nearby surface waters. Although these procedures would reduce the likelihood and extent of routine spills, spills in or near surface waterbodies would contribute to detectable changes that could result in an exceedance of water quality standards. Therefore, the adverse impact on water quality would be short term **minor** adverse.

There are no groundwater resources crossed by the Project. As described in Section 3.21.1.3, the nearest groundwater recharge area would be approximately 1.2 miles from the Project. At this distance, the risk of any inadvertent spill or release to groundwater during construction and installation of the Project would be **negligible** adverse.

New cable emplacement/maintenance: The Project would require the installation of permanent (over the life of the Project) onshore export cable (i.e., the RWEC). This activity would require temporary (up to 18 months) ground-disturbing activities including surficial digging, land clearing, trenching, HDD, and use of equipment and vehicles. The RWEC route does not directly intersect any surface waterbody; however, surface disturbance associated with installation could contribute to erosion and sedimentation in nearby surface waterbodies, thereby leading to changes in water quality. Overall construction activities and Project infrastructure would disturb more than 1 acre, and discharges would therefore need to be permitted through a general construction permit under the NPDES program. Revolution Wind would also develop a stormwater pollution prevention plan as part of the permitting process that would result in implementation of erosion and sediment controls prior to and during construction and installation. EPMs in Table F-1 in Appendix F would avoid or minimize impacts on water quality, and Revolution Wind would comply with all permit and regulatory requirements related to water quality. As a result, adverse impacts on onshore water quality under the Proposed Action would be localized, short term, and **negligible** to **minor** adverse.

The distance between Project-related land-disturbing activities and the nearest groundwater recharge area (1.2 miles) would result in **negligible** adverse risks of a spill or release reaching groundwater resources.

Port utilization: The Project would use nearby ports to support construction and installation of the Proposed Action. Increased use and related activities at ports could increase the risk of accidental spills or discharge to nearby surface waterbodies. Inadvertent spills or releases during construction and installation would be classified as routine and would be localized, short term, and minor adverse. It is not known at this time if port expansions or modifications would be required. If so, these activities would require surface disturbances that would contribute to erosion and sedimentation in nearby surface waterbodies, thereby leading to changes to water quality.

EPMs in Table F-1 in Appendix F would avoid or minimize impacts on water quality, and Revolution Wind would comply with all permit and regulatory requirements related to water quality. As a result, adverse impacts on onshore surface water quality under the Proposed Action would be temporary and **negligible** to **minor** adverse. No impacts on groundwater are anticipated from port use during onshore construction and installation because there would be no required surface disturbance that could encounter groundwater or result in water quality degradations through runoff into groundwater recharge areas.

<u>Presence of structures:</u> The presence of structures from the Proposed Action would result in an increase in impervious surfaces (20 acres) that could contribute to stormwater runoff to nearby surface waterbodies. The OSS would encompass approximately 16 acres, and the onshore ICF would temporarily encompass approximately 4 acres. Fill materials would be used for installation of structures. None of the onshore facilities of the RWEC route directly intersect any surface waterbody; however, surface disturbance associated with installation of onshore facilities could contribute to erosion and sedimentation in nearby surface waterbodies, thereby leading to changes in water quality. EPMs in Table F-1 in Appendix F would avoid or minimize impacts on water quality, and Revolution Wind would comply with all permit and regulatory requirements related to water quality. As described under the new cable emplacement/maintenance IPF, discharges would be permitted through a general construction permit under the NPDES program. Revolution Wind would also develop a stormwater pollution prevention plan as part of the permitting process that would result in implementation of erosion and sediment controls prior to and during construction and installation. As a result, impacts on onshore water quality under the Proposed Action would be localized, short term, and **negligible** to **minor** adverse. The distance between Project-related land-disturbing activities and the nearest groundwater recharge area (1.2 miles) would result in minimal risk of runoff reaching groundwater resources; **negligible** adverse impacts on groundwater are anticipated from the presence of structures during onshore construction and installation.

3.21.2.3.2 Operations and Maintenance and Decommissioning

Offshore Activities and Facilities

<u>Accidental releases and discharges:</u> O&M and decommissioning of the offshore portion of the Project would lead to similar adverse impacts on water quality from inadvertent spills or releases that could occur during construction and installation. The volumes of fuels and oils and number of vessels required during O&M and decommissioning would be less than that required during construction and installation (VHB 2023). The same Project features and EPMs described for offshore construction and installation (see Section 3.21.2.2.1) would be implemented during O&M and decommissioning to avoid or minimize potential spill impacts on water quality. Most inadvertent spills of fuels and oils used during O&M and decommissioning would be classified as routine and minor adverse. Should a routine spill occur, it would be temporarily detectable and would disperse rapidly, thereby limiting the magnitude and extent of changes to water quality. Therefore, changes to water quality would be localized, short term, and **minor to moderate** adverse, depending on the severity of potential spills or releases.

<u>Anchoring and new cable emplacement/maintenance:</u> Anchoring and cable-related activities during O&M and decommissioning would contribute to changes in offshore water quality from the resuspension and deposition of sediment. O&M and decommissioning of the offshore portion of the Project would lead to similar minor adverse and temporary adverse impacts on water quality from anchoring and new cable emplacement and maintenance that would occur during construction and installation. Fewer anchoring

activities would occur during O&M and decommissioning activities compared to construction and installation. Cable activities would also be less frequent during O&M and decommissioning and would typically include maintenance activities that would result in less seafloor disturbance than installation activities during construction and installation. EPMs in Table F-1 in Appendix F would avoid or minimize impacts on water quality, and Revolution Wind would comply with all permit and regulatory requirements related to water quality. As described for construction and installation (see Section 3.21.2.2.1), suspended sediments would typically settle within hours or days, and the extent of deposition would be limited. Changes to water quality from anchoring and cable activities would be detectable but would not result in degradation of water quality that would exceed water quality standards. As a result, adverse impacts on offshore water quality under the Proposed Action would be **minor** adverse and temporary.

<u>Port utilization:</u> The Project would use nearby ports to support O&M and decommissioning of the Project. As described under offshore construction and installation, these activities would result in increased vessel traffic and increased in-water activities, which would contribute to increased suspension and turbidity. Up to 16 vessels would be required during O&M and decommissioning. These activities could also increase the risk of accidental spills or discharges. See offshore activities and facilities analysis in Section 3.21.2.2.1 for details. As a result, adverse impacts on offshore water quality under the Proposed Action would be short to long term but **minor** adverse.

<u>Presence of structures:</u> O&M would not result in additional structures that would lead to impacts on water quality. During decommissioning, structures would be removed to a depth of 15 feet below the seafloor (VHB 2023), which would reduce in-water structures that have disrupted bottom current patterns and led to scouring (as described for construction and installation). Water quality during O&M would remain the same, whereas water quality during decommissioning could result in short-term changes to water quality; however, these changes would be limited in terms of duration and extent (similar to those described for construction and installation of structures). See offshore activities and facilities analysis in Section 3.21.2.2.1 for details. As a result, adverse impacts on offshore water quality under the Proposed Action would be short term **minor** adverse.

Onshore Activities and Facilities

<u>Accidental releases and discharges:</u> O&M activities would require vehicles and equipment that require the use of fuels, oils, and lubricants. The volumes of fuels and oils and number of vehicles required during O&M and decommissioning would be less than that required during construction and operations (VHB 2023). Although unlikely due to distance to closest surface waterbody of 200 feet, any inadvertent spills in onshore waters during O&M or decommissioning would be classified as routine and **minor** adverse (BOEM 2015). See onshore activities and facilities analysis in Section 3.21.2.2.1 for details. As a result, adverse impacts on onshore surface water quality under the Proposed Action would be short term **minor** adverse. Similar to onshore construction and installation, O&M and decommissioning activities would be distanced far enough from groundwater recharge areas (at least 1.2 miles) that the risk of a spill or release reaching groundwater resources would be **negligible** adverse.

<u>New cable emplacement/maintenance:</u> O&M would require limited land disturbance should maintenance be required for underground infrastructure (i.e., transmission cable). Decommissioning of the onshore portion of the Project would lead to the same types of impacts on surface water quality from erosion,

sedimentation as described under construction and installation. See onshore activities and facilities analysis in Section 3.21.2.2.1 for details. As a result, adverse impacts on offshore water quality under the Proposed Action would be temporary and **negligible** to **minor** adverse.

The distance between Project-related land-disturbing activities and the nearest groundwater recharge area (1.2 miles) would result in limited risks of a spill or release reaching groundwater resources; **negligible** adverse impacts on groundwater are anticipated from land disturbance during onshore O&M and decommissioning.

<u>Port utilization:</u> The Project would use nearby ports to support O&M and decommissioning of the Project. As described for onshore construction and installation, increased use and related activities at ports could increase the risk of accidental spills or discharge to nearby surface waterbodies. See onshore activities and facilities analysis in Section 3.21.2.2.1 for details. As a result, adverse impacts on onshore surface water quality under the Proposed Action would be temporary and **minor** adverse. **Negligible** adverse impacts on groundwater are anticipated from port use during onshore construction and installation because there would be no required surface disturbance that could encounter groundwater or result in water quality degradations through runoff into groundwater recharge areas.

<u>Presence of structures:</u> O&M would not result in additional structures that would lead to impacts on water quality. During decommissioning, structures would be removed in compliance with applicable laws and regulations at that time (VHB 2023). Water quality during O&M and decommissioning would remain the same, whereas water quality during decommissioning could result in short-term changes to water quality; however, these changes would be limited in terms of duration and extent (similar to those described for construction and installation of structures). See onshore activities and facilities analysis in Section 3.21.2.2.1 for details. As a result, adverse impacts on offshore water quality under the Proposed Action would be short term **negligible** to **minor** adverse.

3.21.2.3.3 Cumulative Impacts

Offshore Activities and Facilities

<u>Accidental releases and discharges:</u> The Proposed Action could noticeably add accidental releases of fuels, oils, or hazardous material; sediment; and/or trash and debris to conditions under the No Action Alternative. BOEM estimates that the Project would result in an up-to-56% increase in total chemical usage over the No Action Alternative within the offshore water quality GAA. This risk would be increased primarily during construction and installation, O&M, and decommissioning. When the Project is combined with other offshore wind projects, up to approximately 3.5 million gallons of coolants, fuels, oils, and lubricants could cumulatively be stored within WTG foundations and the OSS within the offshore water quality GAA. All vessels associated with the Proposed Action and other offshore wind projects would comply with the USCG requirements for the prevention and control of oil and fuel spills. Additionally, training and awareness of EPMs (see Table F-1 in Appendix F) proposed for waste management and mitigation of marine debris would be required of Revolution Wind Project personnel. These releases, if any, would occur infrequently at discrete locations and vary widely in space and time. For this reason, the Proposed Action when combined with other past, present, and reasonably foreseeable projects would result in short-term to long-term **minor** to **moderate** adverse impacts.

<u>Anchoring and new cable emplacement/maintenance:</u> The Proposed Action would result in localized, temporary, and minor impacts to water quality through an estimated 3,204 acres of anchoring and

mooring-related disturbance. The Proposed Action would add to the estimated 1,862 acres of seafloor that could be impacted by anchoring from other reasonably foreseeable offshore wind activities. This would result in a cumulative total of 5,066 acres of anchoring-related disturbance for the Proposed Action, plus all other future offshore wind projects. Therefore, the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in **minor** adverse cumulative impacts to water quality.

The Proposed Action would result in localized, short-term, and minor adverse impacts to water quality through an estimated 4,009 acres of seafloor disturbance from cable installation, which would temporarily increase suspended sediment and turbidity levels in and immediately adjacent to anchorage areas. This would result in additional turbidity effects, increasing seafloor disturbance due to cable installation, when compared to the No Action Alternative. BOEM estimates a cumulative total of 10,158 acres of cabling-related disturbance for the Proposed Action plus all other future offshore wind projects. Sediment modeling for the Proposed Action indicates that sediment suspension and deposition would occur within an area of up to 328 feet and would settle shortly (hours to days) after the release of sediment (Vinhateiro et al. 2018). Suspended sediment concentrations during activities other than dredging would be within the range of natural variability typical for the affected area. As a result, the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in **minor** adverse cumulative impacts to water quality.

<u>Port utilization:</u> BOEM expects impacts to water quality due to the increase in port use resulting from the Proposed Action to be negligible to minor adverse. Other offshore wind development would use nearby ports and could also require port expansion or modification. However, Revolution Wind and all other developers would comply with all permit requirements to avoid or minimize water quality impacts. Therefore, cumulative impacts associated with the Proposed Action and past, present, and reasonably foreseeable future activities would be **negligible** to **minor** adverse.

<u>Presence of structures:</u> The Proposed Action would result in long-term and minor adverse impacts to water quality through the installation of 102 structures (100 WTGs and two OSSs). This represents a 56% increase over total estimated WTG and OSS foundations under the No Action Alternative within the offshore water quality GAA. BOEM estimates a cumulative total of 283 structures for the Proposed Action plus all other future offshore wind projects within the offshore water quality GAA. These additional structures could cumulatively add to other offshore impacts to water quality from turbidity due to scour and water current alteration. However, because of the limited extent of impacts and BOEM's expectation that Revolution Wind and other developers would comply with all applicable permit requirements to minimize, reduce, or avoid impacts on water quality, the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in **minor** adverse and long-term impacts to water quality.

Onshore Activities and Facilities

<u>Accidental releases and discharges:</u> The Proposed Action would result in negligible to minor adverse onshore water quality impacts on surface water due to discharges and due to dispersal of contaminants during routine spills or inadvertent releases. State and local agencies would be responsible for minimizing and avoiding water quality and other impacts during construction and installation. The Project and other reasonably foreseeable projects would be expected to comply with any applicable permit requirements to implement erosion, stormwater, and spill controls to minimize, reduce, or avoid impacts on water quality.

As a result, the Proposed Action when combined with past, present, and other reasonably foreseeable projects would result in short-term impacts and **negligible** to **minor** adverse cumulative impacts on onshore water quality.

New cable emplacement/maintenance: The Proposed Action would result in negligible to minor adverse impacts to onshore water quality impacts on surface water and groundwater due to erosion and sedimentation. State and local agencies would be responsible for minimizing and avoiding water quality and other impacts during construction and installation. The Project and other reasonably foreseeable projects would be expected to comply with any applicable permit requirements to implement erosion, stormwater, and spill controls to minimize, reduce, or avoid impacts on water quality. As a result, the Proposed Action when combined with past, present, and other reasonably foreseeable projects would result in short-term impacts and **negligible** to **minor** adverse cumulative impacts on onshore water quality.

Port utilization: The Proposed Action would result in minor adverse impacts to onshore water quality due to changes in surface water quality from increased port-related traffic. The Proposed Action would also add to the increased the risk of accidental spills or discharges. Other offshore wind development would also use nearby ports. Revolution Wind and all other developers would comply with all permit requirements to avoid or minimize water quality impacts. As a result, the Proposed Action when combined with past, present, and other reasonably foreseeable projects would result in short-term impacts and **negligible** to **minor** adverse cumulative impacts on onshore surface water quality. The Proposed Action would not contribute to impacts on groundwater quality.

Presence of structures: The Proposed Action would result in temporary and minor adverse impacts to water quality related to the presence of structures, which would also result in an increase in impervious surfaces (19 acres) through the development of 20 acres for the OnSS and ICF. Other offshore wind development would also include the construction and installation of structures and associated impacts to onshore water quality. These additional structures could cumulatively add to other onshore impacts to water quality from turbidity due to scour and water current alteration. However, because of the limited extent of impacts and BOEM's expectation that Revolution Wind and other developers would comply with all applicable permit requirements to minimize, reduce, or avoid impacts on water quality, the Proposed Action when combined with past, present, and reasonably foreseeable projects would result in **negligible** to **minor** adverse short-term impacts to water quality.

3.21.2.3.4 Conclusions

Although Project construction and installation, O&M, and decommissioning would expose and disturb soils and sediments, onshore facilities would not cross surface waterbodies. Therefore, impacts to water quality from potential erosion, sedimentation, or inadvertent release of contamination or hazardous materials or debris into onshore surface waters are not anticipated and would be short term **negligible** to **minor** adverse. Offshore, Project construction and installation and decommissioning would contribute to increased movement, suspension, and deposition of sediments; changes to water column stratification; and mixing patterns that would affect water quality parameters. Impacts from Project O&M would be much lower than those produced during construction and installation and decommissioning but could also result in erosion, sediment resuspension, deposition, and inadvertent spills. BOEM anticipates that the impacts resulting from the Proposed Action alone would range from **negligible** to **moderate** adverse. Therefore, BOEM expects the overall impact on water quality from the Proposed Action alone to be

minor adverse because the effect would be small and the resource would be expected to recover completely without remedial or mitigating action. The Proposed Action would not result in any net beneficial change to water quality.

In the context of other reasonably foreseeable environmental trends and planned actions, the impacts under the Proposed Action resulting from individual IPFs would range from **negligible** to **moderate** adverse. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **minor** adverse impacts to water quality because the effect would be small and the resource would be expected to recover completely. The Proposed Action would not result in benefits to water quality.

3.21.2.4 Alternatives C, D, E, and F

Table 3.21.1 discloses IPF findings for each alternative.

3.21.2.4.1 Conclusions

Although Alternatives C through F would reduce the number of WTGs and their associated IACs offshore, which would have an associated reduction in potential changes to movement, suspension, and deposition of sediments; water column stratification; and mixing patterns, BOEM expects that the impacts resulting from each alternative alone would be similar to the Proposed Action and range from **negligible** to **moderate** adverse. Alternatives C through F would not result in any change to onshore water quality as compared to the Proposed Action (**minor** adverse) and would not result in any net beneficial change to water quality.

In the context of other reasonably foreseeable environmental trends and planned actions, BOEM also expects that Alternatives C through F's impacts would be similar to the Proposed Action (with individual IPFs leading to impacts ranging from **negligible** to **moderate** adverse). The overall impacts of each alternative when combined with past, present, and reasonably foreseeable activities would be the same level as under the Proposed Action: **minor** adverse. Alternatives C through F would not result in benefits to water quality.

3.21.2.5 Alternative G: Impacts of the Preferred Alternative on Water Quality

Table 3.21.1 discloses IPF findings for each alternative.

3.21.2.5.1 Conclusions

Although Alternative G would reduce the number of WTGs and their associated IACs offshore as compared to the maximum-case scenario for the Proposed Action, which would have an associated reduction in potential changes to movement, suspension, and deposition of sediments; water column stratification; and mixing patterns, BOEM expects that the impacts resulting from Alternative G alone would be similar to the Proposed Action and range from **negligible** to **moderate** adverse. Alternative G would not result in any change to onshore water quality as compared to the Proposed Action (**minor** adverse) and would not result in any net beneficial change to water quality.

In the context of other reasonably foreseeable environmental trends and planned actions, BOEM also expects that Alternative G's impacts would be similar to the Proposed Action (with individual IPFs leading to impacts ranging from **negligible** to **moderate** adverse). The overall impacts of the alternative when combined with past, present, and reasonably foreseeable activities would be the same level as under the Proposed Action: **minor** adverse. Alternative G would not result in benefits to water quality.

3.21.2.6 Mitigation

No potential additional mitigation measures for water quality are identified in Table F-2 or Table F-3 in Appendix F.

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3.22 Wetlands and Non-tidal Waters

3.22.1 Description of the Affected Environment and Environmental Consequences of the No Action Alternative for Wetlands and Non-tidal Waters

Geographic analysis area: The GAA for wetlands and non-tidal waters is the Lower West Passage subwatershed (Hydrologic Unit Code 010900040908), which overlaps the onshore Project and is the same as the GAA for onshore water quality (see Figure 3.21-2). This area encompasses the drainage basin and network of surface waterbodies that could be affected by Project activities.

Affected environment: Freshwater and tidal wetlands, lakes and ponds, streams, and other waters are found throughout the GAA (see Figure 3.21-2). Wetlands resources and their functions and values are described in Sections 1.3.2 and 3.1.2 of COP Appendix K (VHB 2023). As mapped by the USFWS National Wetlands Inventory, approximately 1,268.1 acres of freshwater forest/shrub wetlands and 99.3 acres of freshwater emergent wetlands are found near streams, lakes, and ponds throughout the GAA. In addition, estuarine and marine wetland habitat is found in tidal areas near the shore of Narragansett Bay.

Wetlands and other waters are subject to USACE jurisdiction under Section 404 of the federal Clean Water Act (CWA). Under Section 404 of the CWA, the USACE regulates the discharge of dredged or fill material into waters of the United States. The landward limit of jurisdiction in tidal waters (33 CFR 328.4) extends to the high tide line, whereas the seaward limit is 3 nm as measured from the baseline of the territorial seas. The USACE limits of jurisdiction in non-tidal waters is as follows:

- In the absence of adjacent wetlands, the jurisdiction extends to the ordinary high-water mark.
- When adjacent wetlands are present, the jurisdiction extends beyond the ordinary high-water mark to the limit of the adjacent wetlands.
- When the water of the United States consists only of wetlands, the jurisdiction extends to the limit of the wetland.

As described in COP Appendix K, wetland resources also fall under the jurisdiction of the State of Rhode Island following pre-determined physical boundaries mapped on the RIDEM's Environmental Resource Map. Based on this map, the onshore Project components are to be located almost entirely within the jurisdiction of the RI CRMC with the exception of a potential segment of an onshore transmission cable route along Roger Williams Way between Mainsail Drive and Circuit Drive, where the jurisdictional boundary follows Roger Williams Way (VHB 2023). Under the RI CRMC Coastal Resources Management Program-Rules and Regulations Governing the Protection and Management of Freshwater Wetlands in the Vicinity of the Coast (Freshwater Wetland Rules; 650-RICR-20-00-2), wetlands receive a buffer of 50 feet from the delineated edge of the wetland. The area of land within 50 feet is regulated as a separate wetland resource (RI CRMC 2011).

Freshwater and tidal wetlands (e.g., tidal salt marsh, ruderal [i.e., disturbed] forested wetland, ruderal shrub marsh, and vernal pools) were observed in the GAA during the field surveys (VHB 2023). Wetlands and streams delineated within the footprint of onshore Project components and the adjacent areas are shown on Figures 4.3.1-3 and 4.3.1-13 in COP Appendix K. All wetlands, buffers, and ditches within the footprint are summarized in Table 3.22-1. Impacts to these resources require coordination with regulating agencies, including USACE and RI CRMC, prior to any construction activities to determine jurisdiction.

Table 3.22-1. Delineated Wetlands by Project Component

Project Component	Freshwater Wetlands (acres)*	Wetland Buffer (acres)†	Regulated Ditch (feet)‡
Landfall work area	0	0	0
OnSS footprint	< 0.01	0.48	0
ICF footprint	0.10	0.24	148.38
Onshore cable corridor and envelope	0	0.07	0

Source: VHB (2023).

* Freshwater wetlands subject to RI CRMC and the USACE jurisdiction. Although USACE jurisdictional wetlands are present, the proposed activity consists of hand-cutting trees and does not involve a discharge of fill; therefore, a USACE permit is not required. This was confirmed in a letter from the USACE to Revolution Wind on February 11, 2022 (USACE 2022).

† Area of land within 50 feet of the wetland boundary regulated by RI CRMC.

‡ Human-made ditch that is regulated by RI CRMC as an Area Subject to Stormwater Flowage.

The landfall work area was shifted east to avoid a delineated ruderal forested wetland (Freshwater Wetland 1) that is regulated by the RI CRMC and USACE as a freshwater wetland near the coast. Tidal salt marshes west of the landfall work area have also been avoided. There are no wetlands or waters within the onshore transmission cable corridor or easement. However, the cable corridor crosses the 50-foot wetland buffer of Freshwater Wetland 1.

Regulated wetlands within and adjacent to the OnSS and ICF parcels include four freshwater wetlands (Freshwater Wetlands 2–5), tributaries to Mill Creek, and a human-made ditch. Freshwater Wetland 2 (i.e., a small isolated forested wetland) is outside of but adjacent to the OnSS footprint. Freshwater Wetland 3 (i.e., a ruderal forested swamp) occurs along the western boundary of the OnSS parcel and continues off-site around Mill Creek. Freshwater Wetland 4 (i.e., a ruderal shrub marsh with a forested perimeter) occurs along the northern boundary of the OnSS and ICF parcel. Wetland 5 is a small, isolated scrub-shrub wetland within the ICF footprint that is hydrologically connected to Freshwater Wetland 4 by a human-made ditch that is regulated as an Area Subject to Stormwater Flowage. Tributaries to Mill Creek flow north and west through Freshwater Wetland 3, outside the OnSS footprint (see Figures 4.3.1-3 and 4.3.1-13 in COP Appendix K). Vernal pools were identified within Freshwater Wetlands 4 and 5. The OnSS and ICF footprints are designed to avoid most of the 3.92 acres of wetlands delineated within these parcels.

Warming temperatures, increasing storm severity and frequency, and ongoing rising sea levels impact wetland habitats. Large, severe storms can increase sedimentation and erosion, which can lead to habitat alteration. Offshore wind projects aim to combat climate change and associated effects by reducing GHG emissions.

3.22.2 Environmental Consequences

3.22.2.1 Relevant Design Parameters, Impact-Producing Factors, and Potential Variances in Impacts

The Project design parameters that would influence the magnitude of the impacts on wetland resources include the location of and construction of or within the OnSS, ICF, and landfall work area. The following have occurred or would occur to minimize potential impacts to wetland resources:

- Revolution Wind evaluated siting alternatives for the OnSS using the criteria that included avoidance or minimization of disturbance to wetlands and other ecologically sensitive areas.
- In accordance with Section 2.9(B)(1)(d) of the Freshwater Wetland Rules, the Onshore Facilities would be designed to avoid and minimize impacts to freshwater wetlands to the maximum extent practicable. Any wetlands that would be impacted as a result of the Project would be mitigated via the federal and state permitting process in accordance with Section 404 of the CWA and the Freshwater Wetland Rules.
- Onshore Facilities would be sited within previously disturbed and developed areas to the extent practicable.
    - The OnSS and ICF would be located on parcels that are already highly altered and include buried demolition waste.
- Accidental spill or release of oils or other hazardous materials offshore would be managed through the OSRP. Compliance with the RIPDES General Permit for Stormwater Discharges associated with construction activity which requires the implementation of a SESC Plan and spill prevention and control measures.
- Revolution Wind would follow state and federal regulations for alteration of wetlands as applicable.

Erosion control measures implemented during both construction and decommissioning, as well as a facility-specific spill plan implemented during O&M, would decrease the potential for impacts to wetland resources. These Project design parameters would be implemented across all alternatives; therefore, BOEM would not expect potential variances in impacts across the alternatives.

See Appendix E1 for a summary of IPFs analyzed for wetland and non-tidal water resources across all action alternatives. IPFs that are either not applicable to the resource or determined by BOEM to have a negligible adverse effect are excluded from Chapter 3 and provided in Table E2-2 in Appendix E1. Offshore and onshore IPFs are addressed separately in the analysis if appropriate for the resource; not all IPFs have both an offshore and onshore component. Where feasible, calculations for specific alternative impacts are provided in Appendix E4, to facilitate reader comparison across alternatives.

Table 3.22-2 provides a summary of IPF findings carried forward for analysis in this section. Each alternative analysis discussion consists of the construction and installation phase, the O&M phase, the decommissioning phase, and the cumulative analysis. If these analyses are not substantially different, then they are presented as one discussion.

A detailed analysis of the Proposed Action is provided following the table. Detailed analysis of other considered action alternatives is also provided below the table if analysis indicates that the alternative(s) would result in substantially different impacts than the Proposed Action.

The Conclusion section within each alternative analysis discussion includes rationale for the overall effect call determination for that alternative. The overall impact of any alternative would be **minor** adverse because the effects on wetland resources would be small and localized, and with implementation of EPMs, wetland resources are expected to recover completely.

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Table 3.22-2. Alternative Comparison Summary for Wetlands and Non-tidal Waters Impact-Producing Factor

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative G (Preferred Alternative)	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative)
Accidental releases and discharges	**Onshore**: Spills that reach surface water would be expected to disperse rapidly (BOEM 2015). Any discharges from future offshore wind projects are not expected to affect wetland resources within the GAA. Adverse impacts from accidental releases and discharges would be **negligible** adverse, localized, and temporary to short term due to the likely limited extent and duration of a release.	**Onshore**: Revolution Wind would prepare a construction-specific plan in accordance with applicable requirements and would outline spill prevention plans and steps to contain and clean up spills that may occur. All onshore activities would be conducted in compliance with the RI Pollutant Discharge Elimination System General Permit for the Discharge of Stormwater Associated with Construction Activities and an approved soil erosion and sedimentation control plan. Therefore, with the implementation of these measures, accidental releases and discharges during onshore construction and installation are expected to result in short-term **minor** adverse impacts within adjacent wetland resources. The potential for accidental releases and discharges during O&M and decommissioning would be less than during construction and installation due to reduced use of drilling fluids, fuels, oils, and lubricants. Stormwater runoff during O&M of onshore facilities could result in turbidity and sediment deposition that could cause short-term **minor** adverse impacts to wetlands or non-tidal waters Therefore, impacts to wetland resources from accidental releases and discharges would be short term **minor** adverse. The contribution from the Proposed Action would be a low percentage of the overall spill risk from ongoing and future activities in the GAA. Any ballast water discharges from the Proposed Action and future offshore wind projects are not expected to affect wetland resources within the GAA. As a result, the Proposed Action, when combined with past, present, and reasonably foreseeable projects, would result in short-term **negligible** to **minor** adverse impacts to wetland resources.	**Onshore**: Alternatives C through F would have the same onshore activities and facilities as the Proposed Action; therefore, impacts from accidental releases and discharges on wetland resources would be the same as the Proposed Action: **negligible** to **minor** adverse.				**Onshore**: Alternative G would have the same onshore activities and facilities as the Proposed Action; therefore, impacts from accidental releases and discharges on wetland resources would be the same as the Proposed Action: **negligible** to **minor** adverse.
New cable emplacement/ maintenance	**Onshore**: Future offshore wind projects do not include cable emplacement and maintenance within the GAA that would affect wetland resources.	**Onshore**: No direct impacts to wetlands or other waters would occur as a result of onshore cable emplacement or maintenance activities. Temporary soil disturbance during cable installation could disturb and alter nearby wetland habitat, as well as potentially spread invasive species, which could lead to a small,	**Onshore**: Alternatives C through F would have the same onshore activities and facilities as the Proposed Action; therefore impacts on wetland resources would be the same as the Proposed Action: **negligible** to **minor** adverse.				**Onshore**: Alternative G would have the same onshore activities and facilities as the Proposed Action; therefore impacts on wetland resources would be the same as the Proposed Action: **negligible** to **minor** adverse.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative G (Preferred Alternative)	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative)
		localized reduction in habitat quality. With erosion control and weed management measures in place, any impacts to adjacent wetlands during construction and installation would be short term **negligible** adverse. Land disturbance during O&M would be limited to regular maintenance of underground infrastructure, if needed, and EPMs would limit potential impacts from sedimentation. See Table F-1 in Appendix F for a list of EPMs for wetland resources. Adverse impacts on wetlands and non-tidal waters under the Proposed Action would be temporary **minor** adverse. The contribution to cumulative impacts to wetland resources from anchoring and cable emplacement is expected to be the same as the Proposed Action because no other past, present, and reasonably foreseeable projects requiring cable placement/maintenance would occur within the GAA. As a result, the Proposed Action, when combined with past, present, and reasonably foreseeable projects, would result in **minor** adverse short-term impacts to wetlands and non-tidal waters due to surface disturbance in wetland buffers.					
Presence of structures	**Onshore**: There are no known future offshore wind activities that have facilities planned within the GAA. Therefore, impacts to wetland resources would be **negligible** adverse.	**Onshore:** Land disturbances from the presence of structures associated with Project construction and installation would include the 19.53-acre landfall work area, 7.04-acre OnSS, 3.76-acre ICF, and 16.58-acre onshore transmission cable envelope. The OnSS and ICF structures would disturb 0.11 acre of freshwater forested wetland (less than 0.1% of wetlands within the GAA). Soil disturbance during construction and installation could also alter nearby wetland habitat due to sedimentation and spread invasive species, leading to a small, localized reduction in habitat quality. Revolution Wind would also comply with all permit and regulatory requirements related to wetland and non-tidal waters impacts, and the resources are expected to recover with mitigation. As a result, adverse impacts on wetland resources under the Proposed Action would be localized, short term **minor** adverse. O&M of the ICF and OnSS would not impact wetlands or other waters. Project components	**Onshore**: Alternatives C through F would have the same onshore activities and facilities as the Proposed Action; therefore, impacts would be the same as the Proposed Action: **minor** adverse.				**Onshore**: Alternative G would have the same onshore activities and facilities as the Proposed Action; therefore, impacts would be the same as the Proposed Action: **minor** adverse.

Impact-Producing Factor	No Action Alternative	Alternative B (Proposed Action) up to 100 WTG	Alternative C (Habitat Alternative) 64–65 WTGs	Alternative G (Preferred Alternative)	Alternative E (Viewshed Alternative) 64–81 WTGs	Alternative F (Higher Capacity Turbine Alternative) 56 WTGs	Alternative G (Preferred Alternative)
		would be demolished or decommissioned in place, limiting the potential for soils and materials to wash into adjacent wetland resources. Temporary **minor** adverse impacts to wetlands or non-tidal waters adjacent to the structures could occur if debris from demolition washed into the adjacent wetland resources. Additional structures could cumulatively add to other onshore impacts due to an increase in impervious surface from reasonably foreseeable structures within the GAA. The Proposed Action, when combined with past, present, and reasonably foreseeable projects, would result in long-term **minor** adverse impacts to wetland resources.					

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3.22.2.2 Alternative A: Impacts of the No Action Alternative on Wetlands and Non-Tidal Waters

3.22.2.2.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for wetlands and non-tidal waters (see Section 3.22.1) would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities and by permitted and constructed offshore wind COP projects within the GAA. These IPFs are described and analyzed in Appendix E1.

3.22.2.2.2 Cumulative Impacts

This section discloses potential wetlands and non-tidal waters impacts associated with future offshore wind development (without the Proposed Action). In this and the following sections, these resources are collectively referred to as *wetland resources*. The cumulative impact analysis for the No Action Alternative for planned non-offshore wind activities, as well as activities associated with constructed or approved offshore wind projects (without the Proposed Action), is provided in Appendix E1.

<u>Accidental releases and discharges:</u> However, should offshore wind facilities be located within the GAA, there is a possibility of accidental releases of fuels, oils, and lubricants that could affect wetland resources. Any activity would require a facility-specific spill plan outlining spill prevention training, plans, and steps to contain and clean up spills if they occur. Spills that reach surface water would be expected to disperse rapidly (BOEM 2015). Adverse impacts from accidental releases and discharges would be **negligible** adverse, localized, and temporary to short term due to the likely limited extent and duration of a release.

Permitted routine operational effluent discharges to receiving waters (e.g., such as ballast water) are regulated by the NPDES. Any discharges from future offshore wind projects are not expected to affect wetland resources within the GAA.

<u>New cable emplacement/maintenance:</u> Future offshore wind projects do not include cable emplacement and maintenance within the GAA that would affect wetland resources.

<u>Presence of structures:</u> There are no known future offshore wind activities that have facilities planned within the GAA. Therefore, impacts to wetland resources would be **negligible** adverse.

3.22.2.2.3 Conclusions

Under the No Action Alternative, there are no known future offshore wind activities that could impact wetland resources in the GAA. Adverse impacts from future activities on onshore wetland resources under the No Action Alternative would be temporary to short term and **negligible** adverse. Impacts associated with future offshore wind activities in the GAA for onshore wetland resources combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would result in **minor** adverse impacts because the effects would be small, and the resource would recover completely.

3.22.2.3 Alternative B: Impacts of the Proposed Action on Wetlands and Non-tidal Waters

3.22.2.3.1 Construction and Installation

Onshore Activities and Facilities

Accidental releases and discharges: Onshore construction and HDD activities would require heavy equipment use, and an inadvertent release from the machinery or spill during refueling activities could occur. Onshore cables would not contain fluids and would not be susceptible to leaks that could affect water quality. The drilling rig used for HDD would be located within the landfall envelope where there are no wetlands or other waters. Drilling fluids and mud would be transported off-site for treatment, disposal, and/or reuse. Revolution Wind would prepare a construction-specific plan in accordance with applicable requirements and would outline spill prevention plans and steps to contain and clean up spills that may occur.

To protect water quality, all onshore activities would be conducted in compliance with the RI Pollutant Discharge Elimination System General Permit for the Discharge of Stormwater Associated with Construction Activities and an approved soil erosion and sedimentation control plan. The measures employed in the soil erosion and sedimentation control plan would minimize the opportunity for turbid discharges leaving a construction work area. The plan would also include specific measures for handling dewatering discharges and measures for refueling equipment to minimize the opportunities for uncontrolled spills. Therefore, with the implementation of these measures, accidental releases and discharges during onshore construction and installation are expected to result in short-term **minor** adverse impacts within adjacent wetland resources.

New cable emplacement/maintenance: No direct impacts to wetlands or other waters would occur as a result of onshore cable emplacement or maintenance activities. The landfall work area, which would be used during cable emplacement, avoids the nearby freshwater forested wetland (Freshwater Wetland 1) and wetland buffer (see Table 3.22-1). The onshore cable route would follow Circuit Drive to the OnSS, and no wetlands or other waters are within the cable route. However, approximately 94 feet (28.65 m) of the onshore cable route crosses the 50-foot buffer of Freshwater Wetland 1, resulting in 0.07 acre of temporary disturbance in the state-regulated buffer. Temporary soil disturbance during cable installation could disturb and alter nearby wetland habitat, as well as potentially spread invasive species, which could lead to a small, localized reduction in habitat quality. With erosion control and weed management measures in place, any impacts to adjacent wetlands during construction and installation would be short term **negligible** adverse. The cable corridor would be fully restored once construction and installation is complete.

Presence of structures: Land disturbances from the presence of structures associated with Project construction and installation would include the 19.53-acre landfall work area, 7.04-acre OnSS, 3.76-acre ICF, and 16.58-acre onshore transmission cable envelope. The new OnSS and ICF would be constructed adjacent to the existing Davisville Substation to support interconnection of the Project to the existing electrical grid. These structures would require cutting of 0.11 acre of freshwater forested wetland. This amounts to 2.6% of the 3.92 acres of delineated wetlands within the OnSS and ICF parcels, and less than 0.1% of mapped wetlands in the GAA (Lower West Passage subwatershed). There are no streams or other waterbodies within the footprint of the onshore facilities; however, Mill Creek is adjacent to the OnSS.

Freshwater wetlands and wetland buffers within onshore components are detailed in Table 3.22-1 and in Figures 4.3.1-3 and 4.3.1-13 in COP Appendix K. Approximately 0.11 acre of freshwater wetlands and 143.38 feet of an Area Subject to Stormwater Flowage—state-regulated ditch—would be directly impacted by construction and installation of the onshore facilities. Clearing, grading, and hardening in these areas could directly and indirectly impact wetland resources. Soil disturbance during construction and installation could also alter nearby wetland habitat due to sedimentation (see Section 3.21) and spread invasive species, leading to a small, localized reduction in habitat quality. Impacts to wetlands would be permitted and mitigated as described in Appendix F, resulting in recovery of the resource. Implementing EPMs such as erosion and sedimentation BMPs (see Table F-1 in Appendix F) would avoid or minimize impacts on water quality, wetlands, and other waters. Before Project construction, anticipated wetland impacts would require coordination with the regulating agencies, including USACE, RI CRMC, Rhode Island Department of Environmental Management (RIDEM), and Quonset Development Corporation. Revolution Wind would comply with all permit and regulatory requirements related to wetland and other water impacts, and the resources are expected to recover with mitigation. As a result, adverse impacts on wetland resources under the Proposed Action would be localized, short term **minor** adverse.

3.22.2.3.2 Operations and Maintenance and Decommissioning

Onshore Activities and Facilities

<u>Accidental releases and discharges:</u> The potential for accidental releases and discharges during O&M and decommissioning would be less than during construction and installation due to reduced use of drilling fluids, fuels, oils, and lubricants. The additional impervious surfaces at onshore Project facilities during O&M would increase the amount of runoff and stormwater pollutants delivered to nearby wetland resources. Wetlands are important habitats for supporting wildlife, and stormwater runoff filtration and stormwater runoff during O&M could have a short-term effect on turbidity and sediment deposition that could impact wetlands or other waters. Revolution Wind would prepare a construction-specific spill plan in accordance with applicable requirements and would outline spill prevention training, plans, and steps to contain and clean up spills that may occur. Therefore, impacts to wetland resources from accidental releases and discharges would be short term **minor** adverse.

<u>New cable emplacement/maintenance:</u> If O&M activities related to the onshore cable are within the segment of the ROW that crosses the 50-foot buffer of Freshwater Wetland 1, then temporary soil disturbance could alter nearby wetland habitat and spread invasive species, leading to a reduction in habitat quality. Land disturbance during O&M would be limited to regular maintenance of underground infrastructure (i.e., transmission cable discussed above under Section 3.22.2.2.1), if needed, and EPMs would limit potential impacts from sedimentation. Adverse impacts on wetlands and non-tidal waters under the Proposed Action would be temporary **minor** adverse.

<u>Presence of structures:</u> For onshore facilities, no land disturbance is anticipated during regular maintenance. O&M of the ICF and OnSS would not impact wetlands or other waters. During decommissioning of the ICF and OnSS facilities, the Project components would be demolished or decommissioned in place, limiting the potential for soils and materials to wash into adjacent wetland resources. Pre-existing habitats are not likely to be restored as part of decommissioning. Temporary **minor** adverse impacts to wetlands or other waters adjacent to the structures could occur if debris from demolition washed into the adjacent wetland resources.

3.22.2.3.3 Cumulative Impacts

Onshore Activities and Facilities

Accidental releases and discharges: The Proposed Action could contribute construction-related accidental releases of fuel, fluids, or hazardous material; sediment; and/or trash and debris. The contribution from the Proposed Action would be a low percentage of the overall spill risk from ongoing and future activities in the GAA. These types of releases, if any, would occur infrequently at discrete locations in the watershed and at varied times. As a result, the Proposed Action, when combined with past, present, and reasonably foreseeable projects, would result in short-term **negligible** adverse impacts to wetland resources.

Permitted routine operational effluent discharges to receiving waters are regulated by the NPDES. Any ballast water discharges from the Proposed Action and future offshore wind projects are not expected to affect wetland resources within the GAA. Stormwater runoff during O&M of onshore facilities could result in turbidity and sediment deposition that could cause short-term **minor** adverse impacts to wetlands or other waters. Overall, the contribution to cumulative impacts to wetland resources is expected to be localized, temporary **minor** adverse.

New cable emplacement/maintenance: The contribution to cumulative impacts to wetland resources from anchoring and cable emplacement is expected to be the same as the Proposed Action because no other past, present, and reasonably foreseeable projects requiring cable placement/maintenance would occur within the GAA. As a result, the Proposed Action, when combined with past, present, and reasonably foreseeable projects, would result in **minor** adverse short-term impacts to wetlands and non-tidal waters due to surface disturbance in wetland buffers.

Presence of structures: The Proposed Action includes the OnSS and ICF structures that would require cutting 0.11 acre of freshwater forested wetland which is less than 0.1% of mapped wetlands in the GAA (Lower West Passage subwatershed) and 2.6% of wetlands delineated in those parcels. Additional structures could cumulatively add to other onshore impacts due to an increase in impervious surface from reasonably foreseeable structures within the GAA; however, only a small percentage of the 1,367.4 acres of freshwater wetlands are expected to be impacted. The Proposed Action, when combined with past, present, and reasonably foreseeable projects, would result in long-term **minor** adverse impacts to wetland resources.

3.22.2.3.4 Conclusions

Project construction and installation, O&M, and decommissioning would expose and disturb soils and sediments, resulting in potential erosion, sedimentation, or inadvertent release of contamination, hazardous materials or debris into onshore surface waters that could affect wetland resources in the GAA. BOEM anticipates the impacts resulting from the Proposed Action alone would range from **negligible** to **minor** adverse because the effect would be small and localized. Further, the resource would be expected to recover completely with remedial or mitigating action(s). The Proposed Action would not result in any net beneficial change to wetlands or other waters.

In the context of other reasonably foreseeable environmental trends and planned actions, the impacts under the Proposed Action resulting from individual IPFs would range from **negligible** to **minor** adverse. Considering all IPFs together, BOEM anticipates that the overall impacts associated with the Proposed

Action when combined with past, present, and reasonably foreseeable activities would result in **minor** adverse impacts to wetlands and non-tidal waters because the effects are expected to be small and localized. Further, with implementation of EPMs, wetland resources are expected to recover completely.

3.22.2.4 Alternatives C, D, E, and F

Table 3.22-2 discloses IPF findings for each alternative.

3.22.2.4.1 Conclusions

Under Alternatives C through F, Project construction and installation, O&M, and decommissioning would expose and disturb soils and sediments, resulting in potential erosion, sedimentation, or inadvertent release of contamination, hazardous materials, or debris into onshore surface waters that could affect wetland resources in the GAA. BOEM anticipates that impacts resulting from each alternative alone would range from **negligible** to **minor** adverse because the effect would be small and localized. Further, the resource would be expected to recover completely with remedial or mitigating action(s). Alternatives C through F would not result in any net beneficial change to wetlands or other waters.

In the context of other reasonably foreseeable environmental trends and planned actions, the impacts under Alternatives C through F resulting from individual IPFs would range from **negligible** to **minor** adverse. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with each alternative when combined with past, present, and reasonably foreseeable activities would result in **minor** adverse impacts to wetlands and non-tidal waters because the effects are expected to be small and localized. Further, with implementation of EPMs, wetland resources are expected to recover completely.

3.22.2.5 Alternative G: Impacts of the Preferred Alternative on Wetlands and Non-tidal Waters

Table 3.22-2 discloses IPF findings for each alternative.

3.22.2.5.1 Conclusions

Under Alternative G, Project construction and installation, O&M, and decommissioning would expose and disturb soils and sediments, resulting in potential erosion, sedimentation, or inadvertent release of contamination, hazardous materials, or debris into onshore surface waters that could affect wetland resources in the GAA. BOEM anticipates that impacts resulting from each alternative alone would range from **negligible** to **minor** adverse because the effect would be small and localized. Further, the resource would be expected to recover completely with remedial or mitigating action(s). Alternative G would not result in any net beneficial change to wetlands or other waters.

In the context of other reasonably foreseeable environmental trends and planned actions, the impacts under Alternative G resulting from individual IPFs would range from **negligible** to **minor** adverse. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with each alternative when combined with past, present, and reasonably foreseeable activities would result in **minor** adverse impacts to wetlands and non-tidal waters because the effects are expected to be small and localized. Further, with implementation of EPMs, wetland resources are expected to recover completely.

3.22.2.6 Mitigation

No potential additional mitigation measures for wetland resources are identified in Table F-2 or Table F-3 in Appendix F.